STATE OF ORISSA'S ENVIRONMENT
- A CITIZEN'S REPORT



COUNCIL OF PROFESSIONAL SOCIAL WORKERS (CPSW)
BHUBANESWAR



The literacy translation of the 'Malika' concept used on the cover reads like : If (Clouds) will form in the South and 'Pour' in the North - there will be no one in the East - only the ones who stay close to the forest/vegetation will remain as 'stock' to the posterity. 'Malika' - 'songs' usually song at 'Trinath Mela' joints - worshiping place of Bramha, Bishnu, Maheswar often seen under roadside Banyan trees.

TO THE VICTIMS OF ENVIRONMENTAL STRUGGLES FOR SURVIVAL & HUMAN RIGHTS

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Pix : Eastern Media.

Plenty of water, but not for everybody.

WATER

With an annual rainfall that offers 23.46 m.h.am of water per year, 11 major rivers that have a total yield of 78,190 million cumecs and a ground water potential of 23.279 lakh hectare meters. Orissa can be rightly described as rich in water resources. Yet, water which symbolises life, has not reached every part of the State to nourish thirsty months and thirsty lands, for domestic as well as irrigation purposes. The vast potential has not been exploited. While only 70.03 lakh hectare meter of surface water is being utilised, ground water utilisation is as low as 2.75 lakh hectares. However, this not the reason for the scarcity of water in Orissa. Apart from non-exploitation, ill-exploitation and application of unsustainable land, water and crop management practices have put an end to traditionally sustainable and equitable methods of water use while aggravating the problems of domestic as well agricultural water needs.

WATER RESOURCE OF ORISSA

Orissa receives an average annual rainfall of 1.49m over a geographical area of 15.56M.Ha and a total volume of 23.46 m.ha.m. water every year. The estimate shows that about 10.55 m.ha.m. of rain water (out of the above) flows through the river system of Orissa contributed from their catchment lying inside the state. The volume of this runoff is further supplemented by the water received from outside the state. Thus the annual runoff through the rivers of Orissa that drains into the sea or goes to other state is calculated to be 17.43 m.ha.m. The whole surface flow may not be fully utilizable because the coastal plain surface flow can't be retained for utilization. Interstate agreements have made some binding rules for utilization of water flow in interstate rivers. As such 7.84 m.ha.m. of water has been assumed as useful surface flow as per draft master plan.

Table - 1 shows that the State has 7.84 m.ha.m. of surface water resource annually utilisable as per the draft master plan. The climatic parameters, annual precipitation and irrigation potential is presented in Table - 2.

The fluctuation in precipitation in different regions is dependent to a great extent on parameters like elevation of the structural alignment, vegetation, wind direction and temperature.

Table - 1 : Water Resources of Orissa (in m.ha.m.)

Water flow through the network of river systems as surface runoff & discharge through ground water, acquifers & springs.	10.55
Annual river flow from outside States.	6.88
Total river flow to sea or outside States.	17.43
Total ground water restorable for utilisation annually.	1.98
Total annually utilisable water resources from surface flow as per draft master plan.	7.84

The fluctuation in precipitation in different regions is dependent to a great extent on parameters like elevation of the structural alignment, vegetation, wind direction and temperature. Scrutiny of rainfall data during the last 86 years reveal that districts which receive maximum rainfall due to influence of structural hills and vegetation are Sundargarh, Sambalpur, Mayurbhanj, Phulbani, Koraput, Dhenkanal, Keonjhar and Ganjam. But the districts of Puri, Cuttack, Balasore and Ganjam (part) are influenced by wind direction and vegetation. Local depressions in the Bay of Bengal enhances the frequency of precipitation. Some parts of Orissa like Bolangir, Nawapada and Padamapur districts come under the impact of rain shadow zone and receives less rainfall. Since, massive deforestation has taken place and the rainfall is directly co-related to the forests, it has become very erratic and fluctuating in nature, thus making less surface water available.

Table - 2 : Table showing the water resources parameters and Temperature variation in different Agro-climatic zone of Orissa

Sl. No.	Name of the Agro-Climatic Zone	Avg. Annual precipitation of 85 yrs in mm	Moisture retention capacity	Irrigation Potential available	Ground water potential	Mean-Max (summer)	Mean max. (Winter)
1.	North Central Plateau	1400-1550	L-M	Baitarani	L-M	36 C	11.1 c
2.	North Western Plateau.	1400	M-L	Pitamahal Hirakud	L-M	38 C	15 C
3.	Western Undulating Plains	1400	L	Hirakud	L	40 C	12.4 C
4.	Undulating Plains of Eastern Ghats	1400	L-M1	Upper Kolab Upper Indrabati	L-M	37.8 C	11.9 C
5.	Eastern Ghats South Uplands	1325 Balimela	L	Pottery	L-M	34.1 C	13.2 C
6.	South Eastern Region of Eastern Ghats	1300-1400	M	Badanala	M	37 C	10.4C C
7.	East & South Eastern Coastal Plains	1400	M	Rengali	M	38.7 C	14 C
8.	North Eastern Coastal Plains	1400	H	New Mohan	H	39 C	11.5 C
9.	Mid Central Ridge Region of the State	1400	L-M	——	L	37 C	10.4 C
10.	Eastern Ghats (north)	1400	M-L	Pilasalki	M	--	--

SURFACE WATER RESOURCE

Orissa has very rich surface water yield as it receives high rainfall. It is estimated that a total yield of 78, 190 mcm surface water is available from its main river-basins. The proposed utilisation is estimated to be 70.03 lakh hectare mt. A basin-wise analysis of surface water resource is presented here.

Table - 3 : MAJOR RIVERS OF ORISSA : AVAILABILITY & UTILISATION OF SURFACE WATER

Name of the River	Origin	Drainage Area in Km.	Length of Main drainage Channel in Km.	Peak Discharge in Cuces	Annual flow in mm	Main Tributaries. dependable	Total yield in Mcum (75% run-off).	Proposed utilisation from own basin (in lakh/ham)
Mahanadi	Parsiya Raipur dist.in M.P	1,41,600 (66,579 in Orissa)	851 (43,654)	44,740 66, (51,061)	640	Seonath. Hasdeomadn, Ib, Jonk,Ong	45750	37.44
Brahmani	Nagri Village in Ranchi dist. of Bihar	39,033 (22,248 in Orissa)	800	22,640	18,810	Karo,Sankha, Tikira,Sangada Sankoi and Chilanti.	11300	11.31
Baitarani	Ganasika Village in Keonjhar dist & Remal	12,789	365	14,150 (14,158 at head of Delta)	5,755 (5,452 Akhupada)	Arredi, Siri, at Salandi,Kusai, Kukurkata Tel,Kanihari, Gohiri	3000	3.46
Subarna-rekha	Chotnagpur Plateau of Ranchi dist. in Bihar.	19,300 2,123	395	17,000 (16,990)	7,940 7,941	Kanchi, Karkari & Khadkei	1350	1.35
Budha-balanga	Similipal hills of Mayurbhanj district.	4,837 (4,847)	164	5,660	2,177 (637 at Kuliana)	Sore, Gangahar Palpala & Katra.	840	1.04
Rusikulya	Daringbari area of Phulbani dist.	7,753	146	8,495	1,800 (1,762)	Padma, Badanadi Gadahada & Bhaguva.	2110	1.61
Bansadhara	Belelaged village of Phulbani district.	10,800 (8,051 in Orissa)	221	4,700 (4,701)	3,500 (3,460)	Paladi, Gangudi Sananai, Padda-godda, Dhamni Chudaldhua.	1630	1.63
Nagavali	Gunupur village of Kala-handi dist.	9,410 (3,746 in Orissa)	217	6,800	2,430	Jhanjavati, Subarnamukhi & Vegavati.	680	0.68
Indravati	Indravati hills of Kalahandi dist.	7,512	185	6,792	2,800	Bhaskel	11300	11.29
Kolab	Subjaranm hills of Koraput district.	7,639	88	7,358	2,615	Sabar	--	--
Machakund	Mudugula hills of Visakhapa-tnam dist. of A.P.	4,963 (1,478 in Orissa)	192	9,140	4,044	Gurepreonala	--	--
Bahuda	Ganjam, Orissa	--	--	--	--	--	230	0.22
Total	308309	(1,48,104 in Orissa)					78,190	70.03

Values in the parentheses are those collected from the Irrigation department of the Govt of Orissa.
Cumecs = Cubic Metres per second M = Million.

POLLUTION THREAT

The greatest problem of surface water today is pollution from industries, mines, agricultural fields and domestic sources rendering the water unfit for any practical purpose.

Waste water from domestic sources (municipal sewage etc.) generally contain many organic and faecal matters along with disease-carrying coliforms. They are mostly biodegradable but some organic substances like linear alkyl sulphonates present in detergents, are not so. Industrial waste water is likely to contain various types of pollutants depending upon the industrial process. Some of them are toxic and not easily biodegradable. The non-point sources of pollution consists of run-off from agricultural fields etc. containing large quantities of chemical fertilisers, pesticides and faecal matters.

Poisonous Brahmani water : The waters of Brahmani the second largest river in Orissa, is also subject to pollution as a number of industries were set up and mining activities are going on. Water analysis shows that the water is not suitable for use and is not classified as a source of drinking water. Further the stretch of river that was classified as 'C' (Source of drinking water supply with conventional treatment and distinction) has ceased to be so with regard to BOD and stretches, during the second part of the year. With regard to pH. the water quality deterioration is found mainly near the industrial complex as like Rourkela and its Township and Kamalanga in Angul-Talcher area. At many places the margin level of total coliform, bacteria, exceeds 24,000 MPN/10Ml which is bad enough for many purposes.

Mahanadi no Better : Research results show that Mahanadi's water is not directly potable, except in the middle stretches near Kiakata where the population density is less. It also does not conform to class 'C' character at many places.

Pollution Load in Taladanda Canal : This is one of the oldest canal systems of the state and has a length of 82.20 kms covering six blocks of Cuttack district. This supplies water to Paradeep Phosphates Limited and Paradeep Port besides irrigating 28,870 hect. Drain water bacteria was found to have polluted Taladanda water at Cuttack due to the city drainage system.

Ib River Pollution : River Ib which is a tributary of Mahanadi falls into the Hirakud reservoir. The effluent of the Orient Paper Mill which is not adequately treated, is discharged into it causing serious pollution problems.

Rushikulya River Pollution : The Kaifullia Nulla near Aska is polluted by effluents from the Sugar mill and distillery of the Aska. It then flows into the Rushikulya river thereby polluting it too. This apart, the Rushikulya is directly polluted by a highly hazardous mercury bearing effluents from the chemical factory at Ganjam.

Pollution of Chilika : Large quantities of pesticides and agro-chemicals find their way into Chilika through many rivers, rivulets and surface run off. Katre and Das (1988) reported presence of toxic metals like Cu, Pb, Zn, Ni etc., at different depths and regions of the lake.

Pollution of Kolab : Kolab has a numerous source of pollution. They are the MIG Factory at Sunabeda; the fodder farm, Regional Research Station and Seed Multiplication farm at Semiliguda and the NALCO factory at Damanjodi. These also affect the Sathiguda Reservoir.

Release of NALCO, Damanjodi's polluted water.



Pix : Ghani Zaman for CPSW.

Water Quality of Hirakud Reservoir System : According to Das and Dash (1986) the water of Hirakud reservoir is characterised by high alkalinity, Chemical Oxygen demand and other chemical parameters. An Expert Committee report (1983) has also noted with serious concern that cracks have developed in the spillways of the Hirakud Dam due to an "Alkali-aggregate reaction".

Ponds : A SPC study reports that many ponds in the village were found to be atrophied. This was due to sheer negligence and misuse.

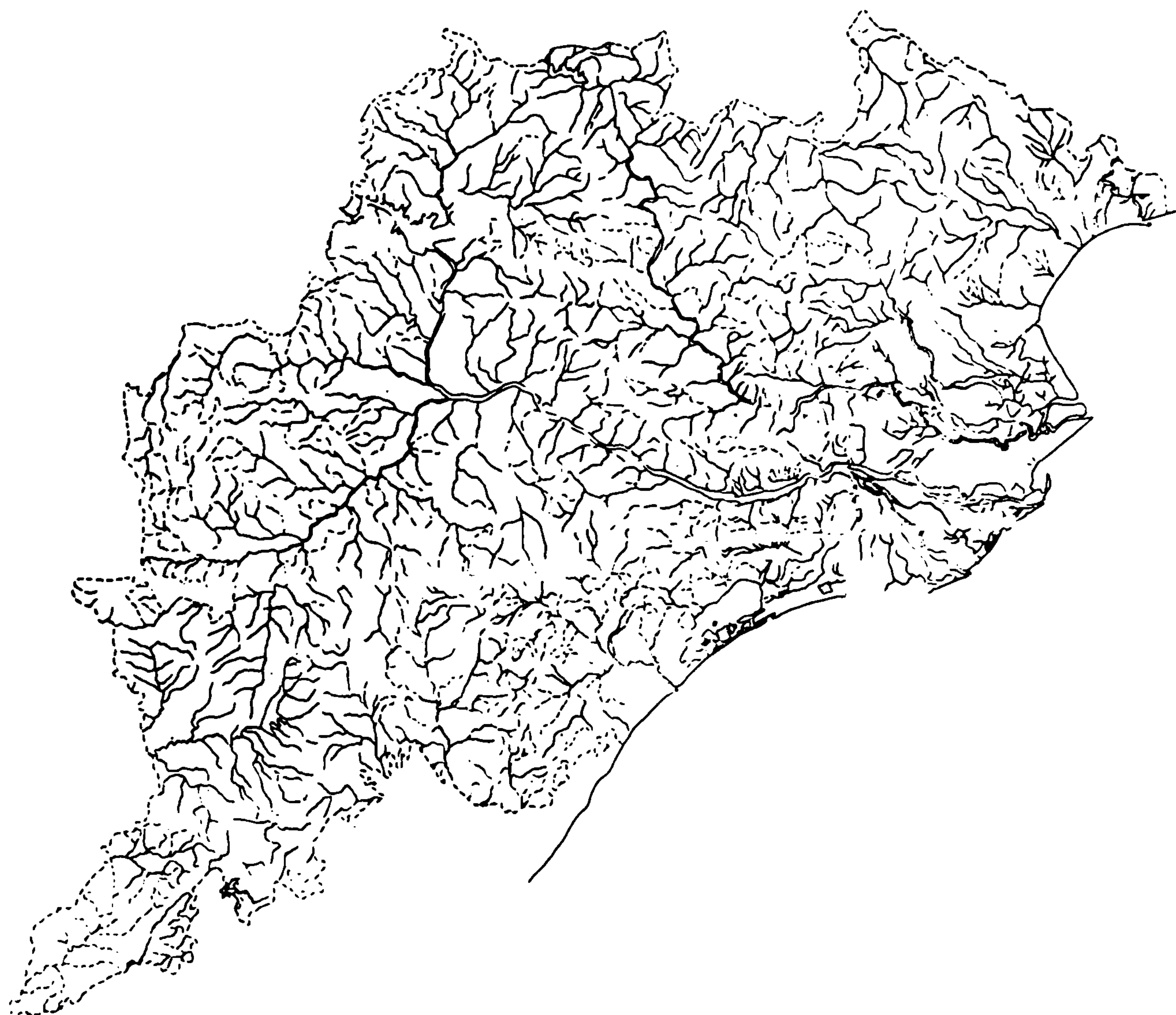
Environmental degradation and pollution is thus causing degradation of water quality that is an essential factor for sustenance of life on earth.



Pix : Ghani Zaman for CPSW.

O.P.M. Brajarajnagar releasing the polluted water to Ib river that flows to Mahanadi.

DRAINAGE MAP OF ORISSA



Source: Watershed Atlas of India

GROUND WATER RESOURCES

Rain water entering the sub-surface ground water reservoir by way of percolation contribute mainly to recharge of ground water. Canal irrigated area, flood in river system, inland water bodies also contribute to this recharge. The annually utilisable ground water resource which can be safely utilised for the development of irrigation and other purposes has been estimated at 19.787 lakh hectare meters out of the total potential of 23.279 lakh hectare meters. This quantity can sustain installation of 11,865 public tube-wells, 28,400 filter point tube-wells and 10.16 lakh standard dug wells to create irrigation potential for 16.21 lakh hectares in Kharif and 9.72 lakh hectares in Rabi season.

Table - 4 : Ground Water Resources of Orissa

(in Lakh hect. Mt.)

Total G.W. Potential	23.279
Annually utilisable G.W. which can be safely utilised	19.787
Present Annual Draft estimated	1.319
Irrigation Potential can be created by G.W. development	16.21 (kharif) 9.72 (Rabi)
Total Irrigation potential so far created	2.75 hect.

It can be seen from this table that so far an irrigation potential of only 2.75 lakh hect. against the total potential of 23.279 lakh hect mt of ground water could be created. Given below is a statement of district-wise ground water potential that indicates the total ground water resources of the undivided districts and the annual utilisable ground water for irrigation.

Table - 5 : District-wise Ground Water Potential

Sl. No.	Name of the Districts	Total G.W. Resources	Annually Utilisable G.W. for Irrigation
01.	Balasore	162556	138173
02.	Bolangir	124444	105777
03.	Cuttack	310	188015.01
04.	Dhenkanal	133445.59	113428.67
05.	Ganjam	143475	121953
06.	Kalahandi	83703.74	71148.18
07.	Keonjhar	99507	84582
08.	Koraput	265803	225933
09.	Mayurbhanj	115009.08	4150
10.	Phulbani	159150	139997.63
11.	Puri	260738.87	221628.04
12.	Sambalpur	255989.92	217591.43
13.	Sundergarh	94243.9	80107.31



WATER QUALITY

Water quality available in an area is as equally important as water quantity. The physio-chemical and bacteriological characteristics of the ground water determines its usefullness for agricultural, industrial and domestic use.

Inland Districts : High Iron & Alkalinity Contents

The ground water is alkaline in nature in Phulbani district. Nearly 87% of the water is found to be of good quality. The fluoride concentration is as high as 3.9 mg/lt at Charichowk. However nearly 50 per cent of samples show high iron ranging from .01 to 1.09.

In the Koraput district ground water contains less than 950 ppm of dissolved mineral water, which is satisfactory for domestic, irrigation and most industrial uses. But as per the National Environmental Engineering Research Institute, Nagpur the deeper aquifer in Koraput district has high iron contents ranging from 1 to more than 10 mg per liter. The ground water is also alkaline in nature.

The water analysis in different blocks show that the pH value ranges from 5.8 to 8.7, conductivity from 0.12 to 2.18 micros/cm and total dissolved solids from 112.5 to 1150.

Flouride & Chromium Pollution : Because of the National Aluminium Co.'s smelter plant at Angul and the Fertilizer plant at Paradeep it is suspected that the ground water in these areas is polluted by fluoride contents. Fluoride pollution of shallow ground water in limited areas has already been reported from Hirakud and Angul areas. With many industries in Orissa using chromite ore it is also necessary to watch the ground waters for hexavalent chromium contamination, a known toxic substance.

Both surface and ground water with high or low pH value if used for irrigation, may cause aridity or alkanity of the soil depending upon its use, nature of the soil and other factors.

Hardness : Water is generally considered soft upto 60 ppm, moderately hard between 60 and 120 ppm and hard above 120 ppm. The tolerance levels of most of the industrial uses ranges from 50 to 250 ppm. The hardness of Brahmani water down stream is 158, at Pattamundai, 160. Mahanadi waters at some places like down stream Ib is 205, at Sonepur 140, at Cuttack 110 and so on. The Hirakud reservoir water shows a total hardness level of 260-280 ppm.

Calcium and Magnesium salts are the principal constituents causing hardness of water. This quantity is found to be very high in the ground water of different districts ranging upto 257, 260 and so on.

Chloride : Gives a noticeable taste at 250 to 300 ppm when present as sodium Chloride. In the ground waters of Ganjam, Puri and Balasore, the chloride concentration is found to contain 1200, 2000 and 887.7 ppm respectively against the recommended standard of 1000 ppm for safe drinking water. Chloride tends to accelerate corrosion of tube wells, pipes, boilers and other fixtures. Also it is injurious to crops when present in excessive quantities. Similarly concentration of fluoride in excess of 1.5 ppm causes dental problems. Fluoride upto 4 ppm in drinking water occasionally produces skeletal fluorides, but above 8 pp coupled with malnutrition positively causes irreversible bone changes and deformities.

Against the recommended 0.3 ppm Iron concentration level for drinking purpose, in Koraput it is found to be 10 mg/1 and as high as 3 mg/1 in Mayurbhanj district. Many industrial uses cannot tolerate more than 0.35 ppm. High percentage of sodium (Na) salt in, irrigation water may make the soil less permeable.

Coastal Districts - High Salinity : Some parts of Balasore, Cuttack, Ganjam and Puri districts suffer from high salinity in the ground water. The TDS value in parts of Basta, Balasore sadar and Basudevpur is found to be of the order of 2287 to 3346 parts per million. In many blocks of Cuttack district, fresh water is found at great depth. In Ganjam district, the TDS value of ground water in some wells located in the coastal area contains about 500 to 2000 ppm. In Puri district the quality of ground water available varies from one place to another. There is a gradual deterioration in quality of ground water in the shallow aquifers towards sea.

DRINKING WATER : THE ELIXIR OF LIFE

As per 1991 census there are more than 50,000 inhabited villages in 314 blocks of the State with a total population of 315.00 lakhs. By seventh plan ending 36,283 identified problem villages were fully covered with drinking water needs and 4,619 identified problem villages have been covered, partially. As on last April 1990, around 1,320 identified problem villages remained without any safe drinking water sources. The National Technology Mission aims at providing 40 LPCD of safe drinking water to every problem village. Keeping this in view the Govt. of India has given the proposal that one hand pump or one public stand be installed among every 150 people. This is to be completed in the 8th plan period.

Of the total 1,86,879 requirement of spot sources, by end of April 1, 1991, 1,11,832 tube wells are reported to be in running condition and by the end of eighth plan it is proposed to take up 55,877 tube wells leaving the balance to be taken up in the next plan. Though provision of drinking water in the villages looks impressive, in reality many hand pumps, tube wells lie unutilised because of their water quality and social acceptability, besides lack of proper maintenance. While the status of water position remains so, the problems relating to quality of water, and its pollution remain the greatest problems.

SAFE DRINKING WATER : PROBLEMS & PROSPECTS IN KORAPUT DISTRICT

The geologists of Orissa Lift Irrigation Corporation carried out scientific source finding work for water in 291 villages from the list of N-category villages identified by Water Technology Mission of Koraput. Scientific water source finding work is a multistage approach for siting safe water sources. Most of the inaccessible and remote N-Villages are in Pottangi, Nandapur, Khairput, Kasipur C.D. Blocks of Koraput mountainous terrain. Getting surface water is not a problem for the local tribes as most of the villages are situated near springs, streams, spring-fed streams, valley springs, but surface water is known to be unsafe. Borewells are feasible near streams low lying cultivated patches.

Well - still the main source of drinking water



Pix : Sanjay K. Khatua.

The common problems encountered in remote N-Villages are :

1. Villagers demand that their borewells be right inside the village and equi-distant to all even if it is unfeasible.
2. Existing dugwells are unhygienic.
3. Spring harnessing tanks are contaminated.
4. Some borewells supplies have more iron content, so villagers still favour primitive sources.
5. In some cases, hand pump lever of existing borewell are stolen.
6. The ground water is alkaline in nature.

As per National Environmental Engineering Research Institute (NEERI) Nagpur, the deeper aquifer in the district has high iron ranging from one to more than ten milligram a litre. It has been observed during source finding work that iron content is less in borewells located near streams or nullahs.

In most of the N-villages, a white clayey strata (lithomerge) lies below the laterite/laterite gravel which serves as a natural filter. The ground water is purified (if polluted) as it flows down through this layer. The depth of the drinking water borewells should penetrate this layer in order to have very safe water. At the same time borewells should not be very deep, to avoid iron contents. However, to make the safe source acceptable, water from the source should be available at the right place, at the right time, in the right amount and with right quality, otherwise the villagers would certainly favour their unhygienic traditional sources.

TUBE-WELLS : The Only Sourrce of Drinking Water

The use of tube-wells as a major tool to tap ground water for drinking and other purposes has already become an integral part of village life. Tube wells fitted with hand pumps are normally used to lift drinking water sources in the villages. Installation of tube wells at present form the major activity of the rural water supply programme.

In the rural water supply system, especially, in the hand pump installation programme, proper and consistent operation, maintenance and repair are considered a very important component in order to maintain sustained service of water supply facilities created. But adequate and suitable maintenance systems are yet to emerge out of the experiments being carried out in various parts of the country. While the problem of supply of safe drinking water to rural areas is getting alleviated through implementation of different programmes, the problem connected with repair of hand pump is mounting to gigantic proportion. 7th Five Year Plan Volume - 2, Govt. of India observes - "While impressive results have been achieved in providing water supply facilities in the rural areas, the maintenance of the facilities, mostly hand pumps, has been badly neglected"

It is observed with anguish that the valuable assets created for provision of water supply in the rural areas involving a huge cost is allowed to go waste and become partially defunct. The 7th Five Year Plan advises the State Governments to create suitable machinery for the regular maintenance of water supply system in rural areas, actively encouraging community participation. It is also expected that the community should participate in the maintenance system. Happily, most of the maintenance system presently being tested are based on community participation in varying degrees.

Unlike the traditional drinking water sources for which construction and maintenance skills are available in the village, the modern tube well installation fitted with the hand pumps are not linked to such a functional infrastructure within or outside the village. This results in frequent malfunctioning of the tube wells.

Orissa's drinking water project, popularly known as DANIDA, initiated its operation in 1985 to providing safe drinking water sources in 20 coastal blocks of Orissa with the aim of bringing about a general change in the health situation in the project area. It also experimented and implemented a maintenance system called the two tire maintenance system, as an integrated part of the project.

III-TIER MAINTENANCE SYSTEM : TOO MANY TIERS

To meet the maintenance needs of the hand pumps in rural areas UNICEF developed the 3-tier maintenance system which was first adopted in Tamilnadu. Orissa also adopted the Three Tier System of hand pump maintenance in 1979. In this system, there is a village level hand pump care taker at the first tier working on voluntary basis. With some elementary training he looks after the routine maintenance and reports if there is any failure of the hand pumps to the second and third tier. The Block level fitter mistri at the second tier is responsible for about 100 hand pumps. He

carries out minor repairs of above the ground mechanism and informs the mobile team when the hand pumps require major repair. There is a district mobile maintenance team at third tier for every 500 pumps. The mobile maintenance team is to reach and repair both above and below the ground faults of the hand pumps. However, this system has not been made operational in all the blocks and does not function satisfactorily primarily due to lack of people's participation and too much dependency on the Third Tier as the block level mistri can only attend to above the ground repair whereas most often faults occur below the ground.

II-TIER MAINTENANCE SYSTEM : GREAT REPLICABILITY POTENTIAL

In this system the significant points of departure from the Three Tier Maintenance system was to identify a person within a village who could undertake all aspects of below and above the ground repair and maintenance needs of hand pumps.

This system has been successfully field tested in three first phase blocks of the DANIDA Project namely Delanga, Rajnagar, and Chandabali towards 1987 and subsequently in another nine blocks in the coastal area.

Encouraged by its effectiveness, acceptance and participation of villagers, and the ability of the artisans as well as its degree of replicability, it is now being implemented in six non project blocks since 1993, as a pilot expansion programme. These blocks include : Nimapara, Dasapalla, Bhubaneswar, Nischant Koili, Garadpur & Pattamundei representing varied topographical, habitational pattern and density of tube wells.

Failure of Tube wells, makes women to walk miles to fetch water and from very low levels.



Pix : Sanjay K. Khatua.

Contributory Maintenance : A study commissioned on the feasibility of contribution by the community for hand pump maintenance in 3 coastal districts revealed that 68% of the users were willing to pay. However there were apprehensions about the long-term commitment of the users. On the other hand, it was apprehended that the government on its part would fail in providing drinking water with continuity through the maintenance of the tube wells. Moreover, other alternative sources and the water quality of tube wells were considered to be another deterrent to the commitment of contributors. However, even with such apprehensions it was maintained that community participation in one way or the other would lead to the sources of the programme.

Pix : Ghani Zaman for CPSW.



The pond in Jeypore dug by the then king meets the requirements of people.

PURIFICATION OF EXISTING SOURCES - AS ALTERNATIVE

At present the government's effort to provide safe drinking water seems to have been in vain. The utilization study carried out by Orissa drinking water project revealed that the extent to which the potential users make use of hand pumps with and without water quality problem is significantly influenced by the availability and quality of alternative water sources. These factors not only influence the volume of water collected from hand pump or from alternative sources, but also the purpose for which the water from different sources is used. (Utilization of Hand pumps, S.K.Khatua & Asger Christensen 1987, DANIDA).

An effort by volunteers to clean the ponds.


Courtsy : Gandhi Peace Centre, Bhubaneswar.

Considering the distance factor, the user-pump ratio has been much lowered recently with the revision of Govt norm of per pump user ratio from 250 to 150 population. In some of the project blocks the average per pump population is about 100 and it tried to keep a core user house hold within maximum 70 mtrs. distance. The utilization study also observed that for day to day needs, variety of other water sources are used. For example, "in 20% of the cases, the water used for cleaning of utensils was from hand pumps, in 53 per cent cases from a pond or river and in 18 per cent of cases from open wells.

The degree of utilization of hand pumps is also influenced by the water quality of the hand pumps. Owing to complex geo-hydrological conditions in many pockets of Orissa, ground water problems like salinity, iron etc. exist. So in their bid to provide safe drinking water it is tried tap water from greater depth through employing complex methods like saline sealing and iron removal plant etc. to get rid of the water quality problem. However, in numerous cases it has not been possible to over come the water quality problem and hence it is common to come across rejected tube wells (involving cost of more than Rs.50,000) standing as reliefs of failure of these agencies. The only alternative which is more economic and easy is the purification of existing sources which are more frequently used then the tube-wells.

VILLAGE WATER BODIES : MULTIPLICITY OF USES

For drinking, cooking, bathing, washing, animal feeding, irrigating & many other activities the villagers usually depend on open wells, ponds, tanks, rivers, canals, streams, tube wells & whatever other water sources available in their habitation or surrounding. The distance at which the water is available, the quality and quantity of water available, influences the health, the hygiene and work load of villagers, especially women folk.

Village Water Sources : A Heritage : Most of the artificial water sources that are found in the villages today were created during the pre-independence period. This is the outcome of the natural process of evolution of habitation and socio-cultural history of the village. Water sources were either created in the process of villagers taking soil from specific places for development of homestead land and construction of houses, or dug by charitable persons, erstwhile rulers, etc. at the time of calamities like drought or religious, welfare purposes, or through villagers own initiative, or after independence, through various state agencies under different development programmes. Most of the huge ponds with bathing ghats and stone walled embankments are inherited from the pre-independence period.

During pre-independence period the digging of ponds, water reservoir and their management, in most cases were entrusted with the village level administrators such as Gountia and Sarbarakar.

The main sources of irrigation were Sagar (big reservoir), Kata, Munda, Bandh and wells which are found in most of the villages. It was an established custom during the Durbar Government to take an agreement from the village headman (Gountia) whenever a village was leased out compelling him to excavate tanks and reservoirs for the agricultural improvement of the village and under clause 24 of the old Gounti Patta he was to distribute water of such reservoirs free of any fee to the tenants for irrigation. Gountias excavating Katas, Mundas were also given protected status which saved them from arbitrary eviction. The lands getting irrigation from the tanks and reservoirs have been noted in the Record-of-rights. Distribution of water was to be made with the help of the Panchayat and Village headman.

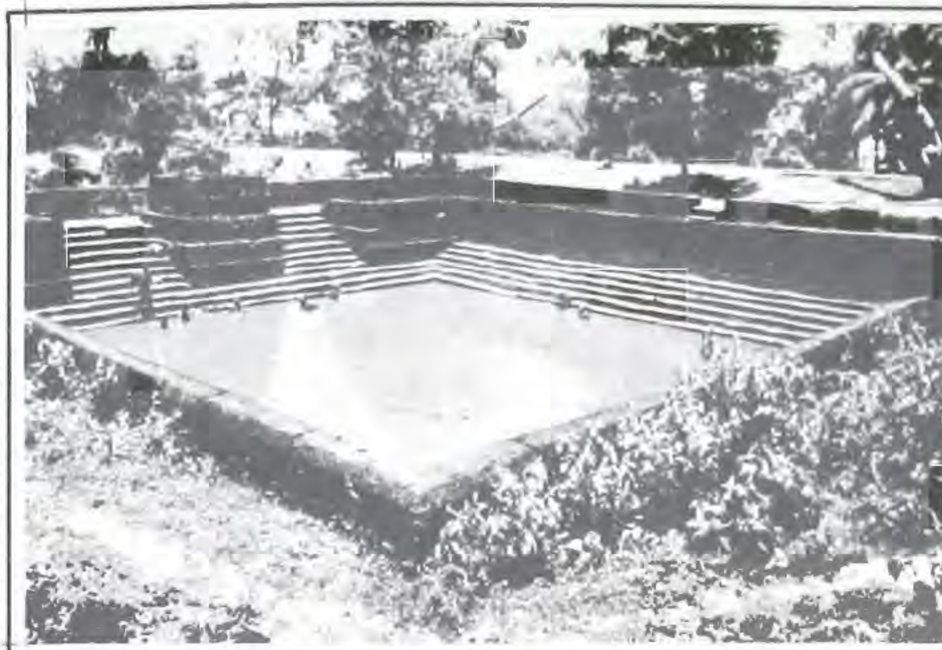
Going by the report of S.L.Maddor, on the Survey and Settlement of the Province of Orissa, 1890-1900, the negligence of surface water bodies seems to have continued from the pre-independence days in spite of their multi faceted usefulness. The situation has not changed much even now. The undulating topography of a major part of the state and inadequate irrigation facilities all over have forced people to depend on the heritage of water sources available and even traditional tools such as Sena, Janta, Kumbhi etc. As per the government estimate, by 1988-89 only 30% of the net sown area had been irrigated. No wonder then that people depend on traditional sources which however, are rapidly deteriorating for lack of care and maintenance.

Table - 6 : Existence of tanks and status of their ownership

Dist.	Total Sample village.	Total tanks	Average per village.	Total common tanks	% of common tanks	Average common tanks in village.
Cuttack	59	371	6.29	98	26.4	1.66
Puri	48	189	3.94	115	60.8	2.40
Balasore	40	172	4.30	77	44.7	1.92

(Source : Survey of Problem villages in the saline belt, Orissa Drinking Water Project/ORG, 1983.)

Ponds : a village heritage.



Pix : Ghani Zaman for CPSW.

INEQUALITY IN DISTRIBUTION OF VILLAGE WATER SOURCES

Because of inadequate presence of ground water and tube well water problems dependency on ground water for various purposes including drinking purpose exist. In absence of any study or yardstick it can be observed that wide disparity exists in case of availability of surface water sources in the 50,000 inhabited villages of Orissa. According to ORG's 1984 survey, in Mayurbhanj district 75% of the villages reported tanks, of which 26% were private & 74% were public. Another of its survey in 1983 of 3 coastal blocks also revealed wide variation in existence of tanks and their ownership. This fact is also corroborated by CPSW study of State of Village Environment of Orissa (See the following table - 7 variations in Existence)

A study by the Operation Research Group (ORG) of 11 villages in 15 coastal blocks (Ref. Table - 7), reveals that for the majority of households the dependence on common water bodies is cent per cent. But mismanagement and misuse are gradually deteriorating these water bodies. Moreover developmental activities encroach on wetlands thus reducing their area. The vagaries of summer also have their toll on open water bodies resulting in difficulties for the people. All these factors, also as the fact that water bodies recharge the ground water, make it imperative that village water sources be take extreme care of.

Table - 7 : Variation in Existence & Status of Ponds & Other Water Bodies

Sl. No.	Name of the Sample vill.	Total no. of H.Hs.	Private Ponds	Common (in acres) Pond	Presence of water source: Canal	River	Stream	Remarks: Water table in Private Pond in May	Water table in Govt. Pond in May
01.	Kartanga (Sonepur dist)	232	1	8 (34)	—	—	—	Dries up	27 ac. dry up
02.	Kansil (Bolangir dist)	233		10 (38.5)	—	—	—		32 ac. dries up
03.	Barpadar (Boudh dist.)	84		1 (4)	—	—	—		Very low water table
04.	Wallipur (Nayagarh dist)	97		2 (0.9)	—	—	—		Dries up
05.	Rundimuhal (Boudh dist)	240		4 (22)	—	—	—		Except one others dry up
06.	Mankadchhuan (Bolangir dist)	81		4 (16.5)	—	—	—		Except one others dry up
07.	Betanda (Jajpur dist)	218	1	3 (1.9)	—	—	—	dries up	dries up
08.	Kusuma (Bhadrak dist)	40	10	1 (2)	—	—	—	dries up	
09.	Adhanga (Kendrapara dist)	186	60 (Most of them are small water holes at the backyard)	1 (0.56)	—	—	—	Except 3/4 others dry up	the full of water hyacinths dries up not used.
10.	Nakhaur (Khurda dist)	142	-	2 (1.25)	—	—	—		one dries up
11.	Kainsi (Kendujbar dist)	140	5	4 (44.7)	—	—	—	dries up	Except one others dry up.

(SOURCE : State of village Environment study, CPSW (unpublished)

Fresh Approach Imperative : It is revealed from the functionability of hand pumps (1987) that 44% of the installed pumps were rejected for drinking water purpose by the potential users. This is more glaring where alternate sources exist. So it is time that the government seriously considers converting traditional drinking water sources into safe ones. In fact tube wells fitted with handpumps are not the only solution to the rural drinking water problem. People's participation is important and its inclusion in the implementation programme is to be considered. The water needs of the villagers needs to be understood in their entity and their generation and management be done accordingly. The provision of common water bodies needs to be standardised. Their management at the hands of the panchayat and other agencies is to be reviewed and user oriented management systems be considered. Rural water needs and resources be reviewed as essential part of village ecology and no more as an isolated issue.

Purification of existing water can meet the requirements in many



Pix : Sanjay K. Khatua.

SURFACE WATER DEVELOPMENT IN ORISSA

Surface water development for various uses is an age old practice. The old Orissa canal system was built as a sequel to the famine of 1866 and was completed in 1883. The other major canal system, Rushikulya was constructed in 1900 A.D. Thus, a total potential of 1,76,920 hectare kharif and 3890 hectare rabi was created through these two systems along with few other medium irrigation projects before the plan period.

Although Hirakud Project and Hiradharbati project, were started before the commencement of plan development, both these projects, were included in the first plan. In addition to this, works of Mahanadi Delta & Salandi project were taken up during this period. Six medium irrigation projects namely Salki, Dhanei, Budhabudhiani, Salia, Derjang, Ghodahad & three major irrigation projects of Mahandai Delta stage -II, Hirakud stage -II and Salandi were taken up during 2nd plan extending for the first time the activities of major & medium irrigation to Dhenkanal, Phulbani and Keonjhar districts.

In addition to two major projects namely Hirakud stage II and eight medium projects continuing from the first & second plan period, only one medium project namely, Bahuda in Ganjam district was taken up in 3rd plan. During the three Annual Plan Periods only two medium Irrigation Project namely, Utei Barrage in Kalabandi district and Pitamahal in Sundargarh district were added to the 14 continuing projects. Again in the 4th plan period, 12 projects including major projects like Rengali Dam, Anandapur Barrage and Potteru Irrigation project commenced. During 5th plan period of 4 years, 19 continuing projects including 2 major irrigation projects namely, Upper Kolab project and Rengali Irrigation Project, 18 new major & medium irrigation projects were taken up for execution. This included the modernisation of Hirakud & Rushikulya irrigation system. Only 9 Projects could be taken up during the two years of Annual Plan, (1978-80). Work in the Upper Indravati Project was commenced in this period. In this period work of replacing old anicuts on Mahanadi & Birupa with gated barrages was also taken up. In the 6th plan period, Subarnarekha Irrigation Project, a joint venture with Govt. of Bihar was taken up along with 14 other projects. Out of these 4 were for renovation, strengthening and extension or improvement work of existing Hirakud, Ghodahad, Baragarh canal and Bhaskel Projects. Three new projects namely Mahanadi-Chitrotapala, Birupa-Genguti and extension of Ramal were taken up during the 7th plan period.

Table - 8 : Development of Major and Medium Irrigation

(In '000 hects)

Sl. Period	Irrigation Potential Created During plans	Cumulative Achievement
1. Preplan period	455	455
2. 1st plan (1951-56)	4	459
3. 2nd plan (1956-61)	363	822
4. 3rd plan (1961-66)	127	949
5. Annual Plans (1966-69)	131	1080
6. 4th plan (1969-74)	59	1139
7. 5th plan (1974-78)	187	1326
8. Annual plans (1978-80)	100	1426
9. 6th plan (1980-85)	127	1553
10. 7th plan (1985-90)	102	1655
11. Annual plans (1990-92) (Anticipated)	51	1706
12. 8th plan (1992-97) (Targeted)	383.5	2089.5

NATIONAL WATER POLICY, 1987

The Irrigation Commission had recommended the formulation of an integrated water policy long back. Water being a prime natural resource and a basic human need, its planning and development should receive high priority and deserves a scientific approach. The policy only talks about the philosophy.

Apart from suggesting that supply of water to water-scarcity areas should receive top-priority, the policy in spite of years of adverse experience advocates the construction of multipurpose projects of course with an eye on the environmental impact of such projects and the rehabilitation of those being displaced. Significantly the policy lays down the priorities of water allocation in the following order : Drinking water, Irrigation, Hydropower, Industrial and other uses. The policy also lays down that water rates should reflect the scarcity value of resources to users who would be motivated to use water economically. However, the policy fails to set priorities with regard to planning and implementation.

Another important aspect of the 1987 policy was to bring Participation of Farmers & Voluntary Agencies particularly in distribution of water and collection of water rates. The policy does not speak of any shift in its thinking in terms of watershed approach, though it talks about conservation, maximum availability, proper allocation and so on. This does not suggest giving power to the people to participate in decision-making of such projects for whom it is meant. Also it is not felt that any thing is learnt from the past in terms of re-thinking for the future.

MULTIPURPOSE PROJECTS : MULTIPLE PROBLEMS

Multipurpose River Valley Projects and mega-dams, have from the beginning of this century been considered as an answer to the increasing demands of power, irrigation and flood control. Experience, however, has proved otherwise and man is still learning the hardway that instead of accruing endless benefits, dams have more often than not induced disasters that crucially outweigh the benefits it provided. It is in this context that some of the river valley projects of Orissa are reviewed. This is an object lesson whereby science and technology can be oriented towards environmentally sustainable programmes in the years to come and as we enter the 21st Century.

ENVIRONMENTAL COSTS AND IMPACT ON ECOSYSTEM

Change in path of monsoon : Destruction of 144 sq.km. of forest area under Dandakaranya project and about 633 sq.km. by the four Dams alone in Koraput-Jeypore-Malkangiri region has affected the path of South-West monsoon. Koraput gets earliest rainfall from the Arabian sea current. The Arabian sea current and Bay of Bengal monsoon current meet at Ramgiri. From here the South-West monsoon marches towards central and north India. As a result of the change in the path of monsoon, Koraput district suffers from flood, drought and water scarcity in summer months. The cost of ecological imbalance of forests and wildlife bio-diversity on one hand, and water logging, salination and table land degradation the other incalculable.

Table - 9 : Officially Stated Loss of Forest & Other Lands

	Name of the project	Forest land	Agrl. & Other lands	Total.
1.	Hirakud	23.988	49,888	74,300
2.	Balimela	19,440	—	19,440
3.	Upp.Kolab	7,788	10,102 + (2,846)	11,350
4.	Upp. Indravati	9,456	7,921 + (4,732)	11,000
5.	Rengali	819+21,500	10,187+(33,719)	41,788
6.	Subarnarekha	948.58	3,716.42+1,895	6,560
7.	Salandi	—	—	1,229

The actual Forest and Agricultural land degraded and submerged has not been properly assessed. However, it is much more than what is officially stated.



Pix : Ghani Zaman for CPSW.

SOCIAL COSTS

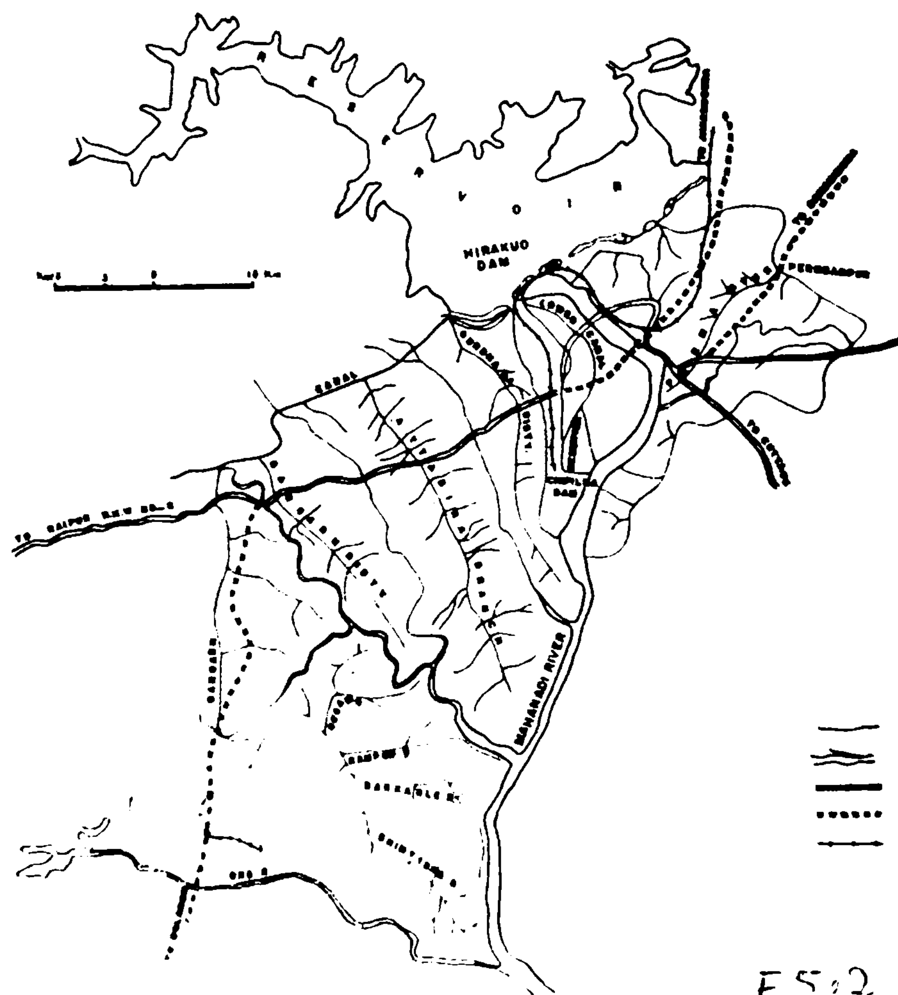
Besides the environmental costs, the social costs that are not taken into account, are glossed over as "Sacrifices" in the national interest. However, it is difficult to quantify the social costs and economists are yet to work on these costs.

Table - 10 : Officially Stated Displacement

Project	No. of Villages	No. of Families
Hirakud, Sambalpur	285	22,144
Balimela, Malkangiri	—	2,000
Upp.Kolab, Koraput	49	3,171
Upp.Indravati,Nowarangpur	95 + 1	3,725 + 82
Rengali, Dhenkanal	248 + 4	10,730
Subarnarekha, Mayurbhanj	16+35+22	612+ 615+2567+2032
Salandi, Keonjhar	—	589

HIRAKUD & MAHANADI DELTA PROJECTS : MORE ILLS

The catalogue of ills that have followed this multipurpose project has belied all expectation that it would transform Orissa into the "Ukraine of India".

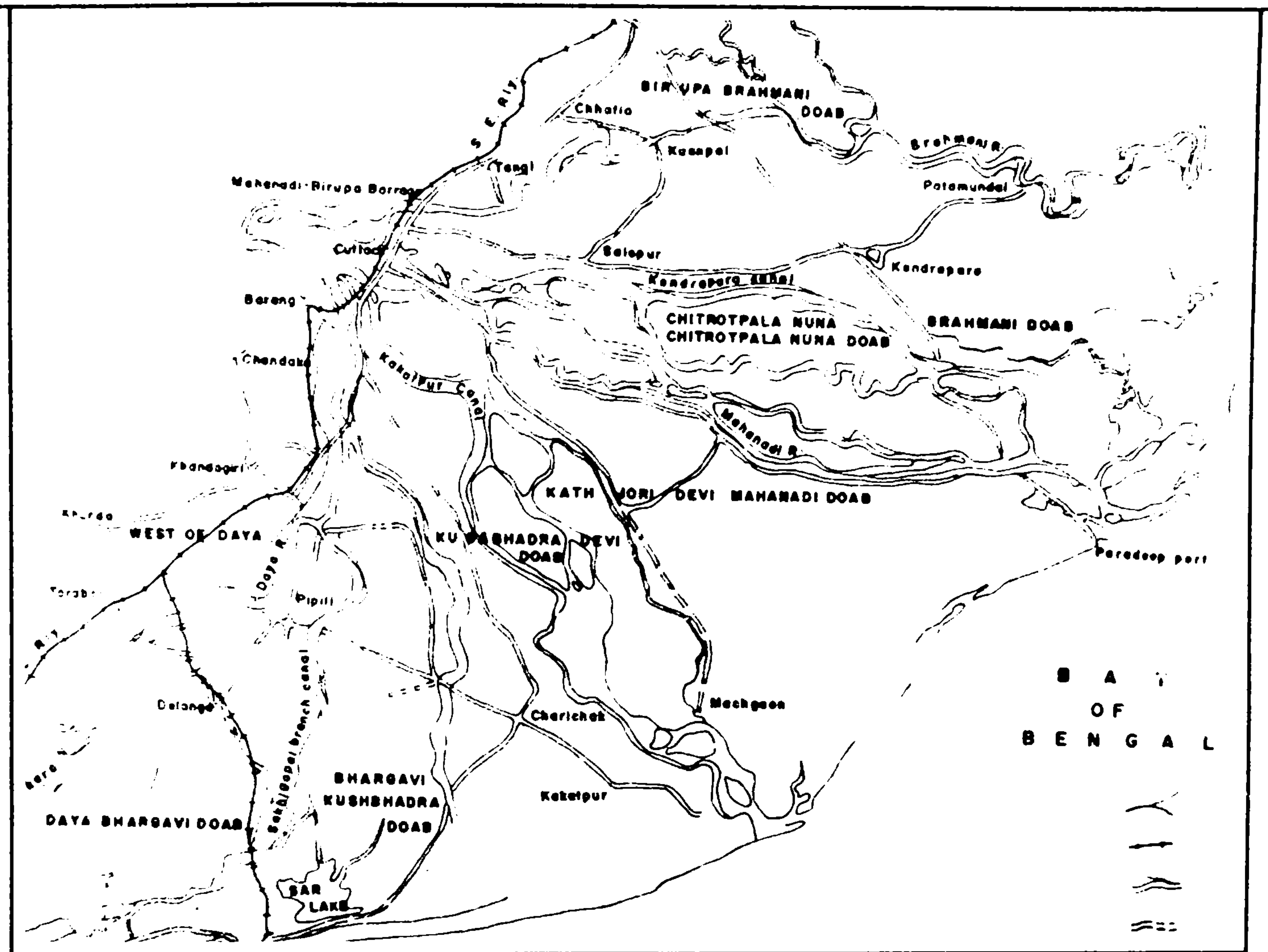


F 5 : 2

Waterlogging has rendered the lowlying-Bahal lands uncultivable. Even the command area is water logged because of inadequate drainage facilities. Continuous irrigation has resulted in the rise of the water table in different parts of the coastal and Hirakud commands affecting also the medium and high lands. As a consequence the soil becomes too moist for cropping. Management of water has added to the problems. There is no official estimate of how much of the canal system has been lined nor is there any estimate of loss due to seepage along the 3,400 kms long scantily lined earth canals. Of course in 1967 the International Water Commission on irrigation and drainage estimated the loss through seepage along the upper Baridam canal between 13% to 19.15%. Evaporation too results in water loss of as much as 90 lakh cubic ft annually. Above all, inequitable distribution of water has led to changes in cropping pattern. In a chain reaction, pests of the stem borer variety and aquatic weed are prevalent in the waterlogged areas causing immense damage to crop and cropland.

Source : Deptt. of Irrigation, Govt. of Orissa.

MAHANADI DELTA IRRIGATION PROJECT



Source : Deptt. of Irrigation, Govt. of Orissa.

The impact of Hirakud has been even more far reaching than can be thought of. It has caused climatic imbalances in and around the command area. Aberrations like drought or excessive rainfall is caused in Padamapur, Patnagarh and Titlagarh sub-division. These abberations are partly due to the reservoir and partly due to deforestation. Thus it is clear that Hirakud has been the cause of more ill than good.

Crop distribution suffers in Head & Tail areas : The tail end areas suffer from acute shortage of water because of excessive use of water in the head end areas. In general, non-paddy crops are observed to be concentrated in tail end areas because of water scarcity for growing rice. Naik (1983) made an analysis of crop distribution in various segments of a distributary at Salipur under Cuttack command during Rabi season. He observed the highest percentage of crop coverage in the mid reach (middle segment) region of the water course from where it decreases towards both head and tail end area. However, the reduction towards head may be due to excess water release from canals resulting in water-logging of low land areas and excessive and unfavorable soil moisture regimes of upland areas (water table being within 20-40 cm of the surface). Similar crop distribution patterns have been observed in other areas of coastal commands. Proper distribution and Management of water again becomes important. Therefore appropriate steps may be taken to achieve uniform distribution of crop and crop coverage in the entire area command by a particular distributary.

Canal water Distribution and Management : WALMI, Orissa did an Action Research programme in an area of about 600 ha. of land in Atala Minor Command of Mahanadi Delta Irrigation Project State II. Two villages under the Atala Minor namely Pahala and Jaipur were selected and studied. It was found that unequal and unscientific water management is leading towards more conflicts and water logging problems. In the study, majority of the farmers (69.0%) expressed that the farmers at head reach, middle reach and tail end of the canal were not getting required quantity of water. According to the survey 42.3% of the farmers had disputes, regarding distribution of water. The youth club of the area played an important role in the resolution of conflicts among the farmers. While 32.4% of the farmers reported that they were obeying the conditions laid down in solving the water disputes, 15.5% of the farmers reported in the negative. There was also provision for punishment of the party who disobeyed the conditions. They used to socially boycot the farmer who did not obey the conditions. Sometimes informal fines were also collected for disobedience. As far as the formation of water users society, majority (39.4%) of the household have suggested that an Organisation consisting of government and farmers representative should be formed to settle the disputes. While 15.5% of the opinion that it should be formed by the farmers only, not a single household was in favour of its formation by government alone.

DAMN THE PEOPLE

The first of many people's movement in Orissa can be traced back to the one against the Worlds' Largest Earthen Dam, at Hirakud in Sambalpur district. Spanning over 2 years, one of the strongest movement against the dam which expressed the desire of people opposing its establishment. It was the starting point of all such movements in Orissa and served as a beacon light and inspired other movements.

The Dam's Genesis : The problem of perpetual floods in the coastal region was sought to be solved by several individuals and committees. As early as 1858 Sir Aurthun Cotten proposed that weirs, embankments and irrigation canals be constructed to prevent floods. The Govt. of India committee of 1927 rejected the construction of embankments but the flood enquiry committee of 1940 was for it. Meanwhile in 1937 Mr.Viseswaraya suggested that the construction of a reservoir would serve several purposes like controlling flood, extending irrigation, generating power etc. He however,warned that this should be done after full survey and investigation. Eventually in 1945 the central water and power commission took up the case and suggested that a dam be constructed. The same year in November the central Government, the Government of Orissa, Madhya Pradesh and the Feudatory states met and approved the proposal of constructing a dam across the river Mahanadi at Sambalpur.And finally the foundation stone of the dam was laid by the then Prime Minister of India, Sri Jawaharlal Nehru in March 1946.

PEOPLE'S STRUGGLE : The decision to construct the dam was taken so hastily that people were taken by utter surprise. Interestingly, the construction of the dam started in 1946 while the scheme and estimate of the dam was published only in 1947 showing view rushed was the project. However, reaction against the dam was widespread. The people were given to understand by the then Irrigation Minister Mr. Radhakrishnan Biswas Rai that the dam would prevent floods in coastal district and enhance their economic status all at the cost of submerging 249 villages in Sambalpur district. This created a popular and angry upsurge. It become clear to the people that they would be displace and lose 1,82,592 acres of land of which 123,000 acres was cultivable land. Moreover, the famous fertile belt classified into fire groups, namely Berma, Bari, Mal, Bakal and Barcha, would be lost for ever. This was more than people could bear. Consciousness of the dark clouds looming over them spread like wildfire protest was in the air. Saving danger the government immediately changed its stance and propagated that apart from flood control in the coastal regions, the dam would enhance the State's Economy by the modernisation of the state's irrigation system and industrialisation that power generation of the Hydel Project would provide.

People were however, not food winked. When notification for land acquisition was served in 13th Sept. 1946 to 95 villages and later to many others the people became active organising meetings and strikes in villages and towns. At first the initiative was taken by local leader but soon many congress activists like Mr.Suadhakar Sapukar, Mr, Bodhram Dube, Mr.L.N.Mishra, Mr,Prahalad Railal and Mr.Bharat Nayak, faired and gave leadership to the movement.

They argued that if floods were the danger in coastal areas then the people of the coastal region, where floods caused havoc, could be resettled. They also pointed out that floods were caused in the coastal districts of Cuttack and Puri because of their Unplanned canal system & not due to the Mahanadis over spilling. But all these arguments fell on deaf ears, meeting to mobilise public opinion were therefore held at many villages and towards in Sambalpur and ever in Cuttack. Though these were widespread and done on a very large scale they were peaceful and non-violent. Of course the people violated prohibitory orders to keep off the dam site and held processions, demonstrations dharana etc in Sambalpur town. They even demonstrated in front of the Governor's residence. But all this was no avail.

Unfortunately, the agitation took a different form altogether when some of the leaders advocated a separate Sambalpur. The congress leader Mr. Janardan Pujari gave the call and other colleagues of his like Mr.Sardhakar Supakar, Mr.Bodhram Dube etc. followed. This was damaging to the movement its aims were divided as well as its leadership. The government reacted against this vehemently and the National and State leadership of the Congress asked their members to withdraw from this separatist movement threatening them with dare consequences if they did not. the leaders wilted under such pressure and by 12th September 1948, when the construction of the dam was inaugurated all had withdrawn. This broke the movement into shambles. With no leadership the common mass could not raise their voice. The movement was further aborted when these congress leaders turned colour and sang songs of the benefit the dam would bring. Thought this complete turn over of events, the anti Hirakud movement had a premature death.

There are many reasons for the failure of the movement. It started at a time when modernisation and industrialisation were the slogans of the day, therefore the zeitgist of the time was a natural hindrance.

This apart, the lack of proper co-ordination and organisation by leaders, the separatist stand of leaders in the later stage, the eventual betrayal of the leadership and the lack of alternative recommendations by the movement all combined to bring about the downfall of the Anti Hirakud movement. However, when all is said and done the movement of people against Hirakud has great historic importance as the first of all people's movement in Orissa.

Utilisation of canal water : Adoption of cropping patterns keeping in view the quantity of canal water available and also utilisation of canal water according to crop-water-requirement is an essential step for increasing the productivity. Enquiries about the farmers' awareness of quantity of water required for the crop they are cultivating, use of water as per requirement, cultivating a particular type of crop keeping in view the availability of water, water logging etc. were made during the survey.

The study revealed that only 19.7% of the farmers know about crop water requirement whereas 66.2% of the farmers were ignorant of the water requirement for different crops. Out of those who knew, only 42.9% used water according to the requirement. The study further revealed that most of the farmers (54.9%) adopt the cropping pattern keeping in view the availability of canal water. It was found that water logging had been a constant problem in that area as 39.4% of the farmers reported their land being water logged. The lands in the low lying areas, mainly suffered from the problem of water logging. Absence of extraction of outbound drawn were also, some of the important factors aggravating the water logging problem. The study further revealed that 78.6% of the farmers whose land were water logged, reported a reduction in the yield rate that was around 30 to 50% acre.

Dr. A.B.Jena, (Retd. Chief Engineer, Govt. of Orissa) wrote, "In Orissa, it is often found that, crops fail towards the end of monsoon due to scanty rainfall". He suggests that water be retained in storage reservoirs to be supplied through canals for early seedling. Also water from water logged areas can be recycled in canals by arranging suitable pumping system. Before closing canals, water can be stored in village tanks and low lands to meet the drought condition. It is desirable to release water from reservoirs of multipurpose project, if there is heavy demand to combat drought situation during flowering & maturing of crops. Consecutive use of ground water & tapping of ground water by tube wells are also to be encouraged. The pumping from dug wells will depress ground water table which will improve productivity.

WATER LOGGING & LAND SLIDES IN UPP.KOLAB PROJECT

Upper Kolab Irrigation Project estimated to cost Rs.16,000 lakhs (1992) with its C.C.A of 4,7715 ha. In the Jeypore plateau is currently providing Irrigation to 15,000 ha. (June, 1992). Jeypore main canal of 58 km. length, with 970 km.s of branches, distributaries & Minors has a major net work of irrigation & drainage channels spreading from Jeypore to Kotpad in the Indravati-Kolab doab. The Project aims at an increase of cropping intensity to 186% from the existing level of 75%. The project at present utilises for irrigation the regulated power release of 98 cumecs from the Stage-I, Hydro-Electric Project, which was commissioned in 1987. The project poses certain serious environmental problems related to (a) Instability of the canals in deep cutting reaches, (b)Loss of Forest land for the canal system (c) Possible long term adverse response to the Irrigation of the command area soils having medium permeability particularly in the lower horizons.

WATER LOGGING

Although about 20,000 ha. of the command area, in the head, has steep slopes (1.5 to 2 m per km.) the tail area of 20 to 25,000 ha. is relatively flat with slope of 0.5 m to 1 m per km. This is particularly the case close to the rivers Kolab & Indravati in Kotpad area. The soils are of semipermeable to impermeable nature. In addition, 10,000 ha. in the tail area is flood prone particularly due to the spill of Indravati river, which has a bankful capacity of only 1,200 cumec. and inundates the area once in three years. Indravati river has to convey upto 10,000 cumes under extremely high flood condition. The lower Kolab basin is similarly flood prone with flash floods predominating.

Head-Reach : From a monitoring of water level in a few open wells in the command of Padamapur distributary close to Jeypore town where continuous Kharif and Rabi irrigation for paddy is continuing for the last four years, it is observed that the water table in summer (April-May) has come upto 1 m below the ground from 5 m in the pre-irrigation stage, but when the canal gets closed for a 45 day spell in the May-June period, the water table drops by 1 meter - 2 meters. This is because the lower horizon is of medium permeability and sustained irrigation may not create serious water logging problem, as it is believed.

Middle reach : But, irrigation has just commenced in this area (1991). The Jeypore Main Canal command (upto 20 kms typifies the middle reach and the ground water table in the pre-irrigation condition in the summer by and large is 4 to 7 m in up and medium lands, but is only 1 to 2 m below the surface in low lands. There is clearly a necessity for controlled irrigation particularly in the low lands as the lower horizon soils are tight.

Tail Reach : Irrigation has not so far been given to this area. In the Kotpad region the variation of ground water table from the summer to the monsoon season is as high as 10 to 15 m. The yield from the ground water reserve in non-monsoon periods is minimal, because of relatively impermeable strata. What is characteristic is the rise of ground water table by 3 to 4 meter within the month of July following first rains (up to 300 mm) and quick rise thereafter to 0.5 to 1 m below the surface by the end of monsoon. As there is ample monsoon rainfall of 1500 mm. Very little supplementation in the Kharif season is needed and irrigation will have to be absolutely controlled. Unless water use is very strictly regulated, the only available good lands will go waste in few years.

LAND SLIDES & STABILITY PROBLEM OF CANALS

The main canal of Upper Kolab Project which is a contour canal carrying 98 cumec. at the head follows a highly undulating terrain over its 58 km. length, negotiation deep cuts upto 17 to 18 m for 300 to 400 m length followed alternatingly by high filing upto 10 to 15 m. Such an unfavourable /expensive alignment was unavoidable from economic consideration in the hilly district of Koraput. This has resulted in some serious problems of slope instability in deep cuts and land slides. After excavation of the canal from 1980 onwards all the deep cuts have experienced sloughing, sliding, pore-water seepage at the too causing instability. A massive land slide occurred in November, 1991, causing a large mass of 200m x 50m from the hill top to move into the canal. A senior Geologist of GSI, Bhubaneswar carried out Geotechnical investigations on the failure of the banks of the Kolab canal at several sections between RD 2.59 to 16.9 km. of the right main canal system around Jeypore in January, 1992. The causes of failure were pointed out to be continued precipitation over a long period resulting in saturation of the residual clay layer by seepage of water through the waste-dump & laterite/latosol layer. Being impervious this zone didn't allow free drainage of water. The soils/rocks along the alignment are highly weathered, friable, semipervious to pervious and basically with poor cohesion having low clay content.

5.10

A major failure of the section of the Padamapur Distributary at RD.8.7 km occurred in August, 1991 following heavy rain fall. With great difficulty, two rows of NP - 3 hume pipes were embedded in a cut and cover section of 27.5 m length to restore the irrigation. Despite continued Instances of failure it is difficult to understand the motive behind such constructions.



Environmental impact of such water reservoirs is not properly assessed.

Pix : Ghani Zaman for CPSW.

THE SUBARNAREKHA PROJECT : THE MYTH OF IRRIGATION

This multi-state project meant to benefit Orissa, Bihar and West Bengal is to provide 1,480 mm water to Orissa and 3,947 mm to Bihar. Besides the project is supposed to provide irrigation all the year around to maximise the agricultural production in the 142,276 ha command area located in the drought prone tribal belt of Singhbhum district (b) to meet the industrial and domestic needs of major industries in the mineral rich area of the project and (c) afford flood protection to Midnapore and Balasore districts of West Bengal and Orissa respectively. The possible environmental effects seem to be water load induced seismicity, floods, and sedimentation threatening the project, having an adverse impact on the environment and bringing to nought the objectives of irrigation.

As it is designed the water stored in Chandil/Ichha dams in Bihar will be released through Galudiha barrage to Orissa. The State intends to use this water for irrigating 92,641 ha. (Net CCA) in Mayurbhanj and Balasore districts. For 'efficient' utilization of water, Orissa intends to create some secondary storage. This is done by constructing two new dams - Jambira, and Baura - and by increasing the storage capacity of the existing Haldia reservoir.

Reservations against the proposed two new dams - Jambira and Baura have been voiced. The purpose of these dams is not that of storing run off of a river, but for storing water that will be released from Ichha dam and transported to Orissa by a 100 km long canal. Consequently, these dams are not being built across rivers or streams as dams are usually built, but literally across gently terraced fertile paddy fields. The two dams together will submerge some 5440 ha. of land, over 70% of it is good paddy land. In the process, it will deprive some 10-12,000 people of their home, land and livelihood.

The two reservoirs are shallow. Jambira dam is 7.5 km long, Baura is 10 m long. Average water depth is seven to eight meters. The loss of water through evaporation and percolation will be high, probably as much as 35%. The fast depletion caused by water will leave large marshy areas and will provide excellent breeding ground for mosquitoes. The problem of waterlogging of lands adjacent to reservoirs might also crop up as the difference in gradient is small.

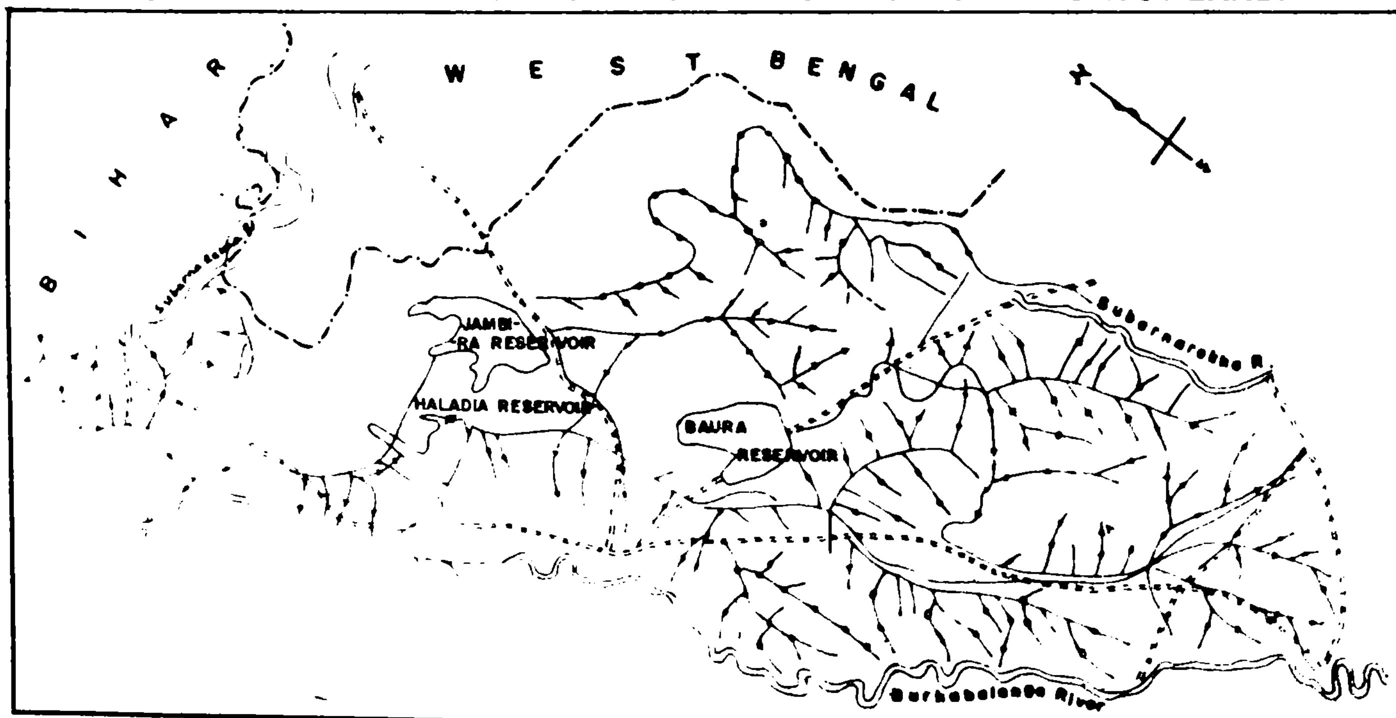
There is no need to create so much havoc just for utilizing a mere 0.47 MAF water. On the contrary, full utilization of water is most probably possible without constructing the two dams. After all, Jambira and Baura is providing a 'second tin storage (The first or primary storage is already provided by Chandil and Ichha) There is no reason why Chandil and Ichha reservoirs in conjunction with Galudiha barrage cannot be operated in a way that makes the second storage redundant. Construction of Haldia, Jambira and Baura reservoirs will displace 3,42 families. The Adibasi communities to be displaced are Bathudi, Bhukta and Santals. Sabai grass cultivation and Tsar cocoon rearing are the two occupations of these Adibasi people.

As the dams of the Subarnarekha project are situated in one of the oldest rock systems of the world, these rocks are vulnerable to earthquakes and have provided tremors that hit Koyana dam, located in the peninsular shield of India considered to be one of the most geologically stable and non-Precambrian shields in the world.

Full flood control in Subarnarekha is also ruled out since Chandil and Ichha dams are located in the Upper and middle sections of Subarnarekha in Singhbhum district.

The Bihar government is now studying in full the suspended sedimentation data of Chandil and Ichha dams. Sedimentation will not only disturb the stability of the environment at the mouths of Budhabalanga and Subarnarekha but will also alter the course of the South-West monsoons that originate in north Balasore and pass through the Similipal-Meghasan Range. A study of the effect on forests, wildlife and environment projects reveal that degradation of forests, destruction of wildlife, loss of rare species of plants, water logging of fertile land and rise of water level in red earth soil tract, increase in the salinity of land, heavy metal pollution, increase in environmental diseases like malaria, filariasis, scistosomiasis, trachoma, chronic sheet erosion and increase in cost of pest control and medical care could occur.

SUBARNAREKHA IRRIGATION PROJECT VS. PROTECTED FOREST LAND.



RENGALI : WHO WANTED IT ?

Built over Brahmani, Orissa's second largest river, the Rengali dam was rendered operational in December 1985. The dam submerged an area of 215 sq. kms of rich forest area cleared for rehabilitation of displaced families. The dam is also vulnerable to seismicity. Mild tremors have already been experienced for 7 seconds at Angul, Meramandali, Talcher, Dhenkanal towns, south west and east of the dam. Reservoir induced seismicity is also not ruled out. The dam site is founded at the meeting of two distinct rock formations. The cost of the dam had also gone up by eight times as per the cost upgradation by WAPCOS. The project has the potential to irrigate, 2,07,100 ha submerging 44,725 hec. displacing 9530 families from 225 villages and 1200 families from 23 hard core villages and 66 inhabited ones. Around 10,187 hec. of land was privately acquired at a cost of Rs.30 crores. There was widespread people's movement opposing the dam.

Opposition to Rengali Dam : The opposition to the dam continued with mass meetings at Bahadaposi, Bamara and Naikul in 1972. Slogans like "Bandha Bandi Kara" rent the air. This culminated in a showdown at the foundation laying ceremony by the Prime Minister when he was there. The BNC organised demonstrations with Black flags, wearing of black badges, dharana and converting arrested by violating section 144 of IPC. The Government quickly assessed the situation and arrested most of the leaders of the BNC including R.K.Deo, B.G.T Deo, Balaram Sahoo and others. It is at this momement that the movement reached its nadir. The BNC almost went into hibernation, became inactive and passive for three years from 1972-1975. The only course of action they took was to file suit in the High Court and wait on it.

The movement however was revived in the year 1975 under the leadership of Mr.Pabitra Mohan Pradhan of Talcher. On 15th March 1975, a large meeting was held at Gogua. Mr R.N.Sahoo who spoke on the occasion aroused the people once again against the Dam reminding them that they had to pay with their livelihood & their lives if the dam were constructed. Later in May the BNC now revitalised under P.M. Pradhan organised a procession which went on its way to Rengali Showing the slogan of their lives.

"Maribu Pachhe Chhadibu Nahin,

Budibu Pachhe Uthibu Nahin"

The declaration of emergency in 1977 put an end to all protests and now the construction work continued unhindered. Then came the election and many anti-dam leaders became MP & MLAs. Belonging to the party in power they gave the hope that the project would be shelved. But in spite of prolonged and successive negotiations the government did not relent, instead the progress on construction work continued steadily.

Frustrated but not completely hopeless, in March 1978, the leaders of the BNC met the Prime Minister Mr. Moraji Desai and the President Mr.Sanjeeva Reddy appealing to them to consider withdrawal of the dam. This was of no avail and therefore the leaders gave as call in press statement on 26th March 1978 to continue the fight against the dam. This increased the people and there were sign of upheaval especially in the villages to be submerged but people had by now come to accept the fact the government would never close the protest. Even a meeting by Mr.Biju Pattnaik, the then Union Minister of Steel and Mines and Mr.N.M Routray, the Chief Minister on 7th May 1978 did not assure them.

CHRONOLOGY OF EVENTS

February - 1971 : Report of Mr.Fergusson From Holland on flood Situation in Orissa and recommendation for construction of dams.

June - 1971 : The Rengali Bandha Pratikriya Samiti formed.

30th Aug. 1971 : Public Rally to Gogua, 5000 attend & A Mass rally at to 10th Jan.1972 Gangoysan & Delegation of BPS meet Irrigation Minister.

1st Dec. -1972 : Division of the Bandha Pratikriya Samiti into Purnarbasati O Thaithan Samiti and Bandha Nirodh Committee (BNC)

December 1972 : Rallies organised by BNC at Bahadaposi and Bamara respectively & Foundation stone of dam laid, BNC leaders Mr.P.K.Deo, G. Deo, Balaram Sahoo arrested.

1972 last to January - 1975 : BNC inactive and dormant.

15th March 1975 : A revitalized BNC meets at Gogua

to May - 1975 March to Rengali by thousands with slogans :

"Maribu Pachhe Chhadibu Nahin,Budibu Pachhe Uthibu Nahin"

Dec. 1977 : Election in which many leaders of the movement come to power.

12th Feb. 1978 Mass Rally at Deogarh under leadership of Mr.P.M.Pradhan to 10th May Opposition to dam reiterated. Mr.Balaram Sahoo, BNC secretary and Mr.Prassanna Acharya, BNC meet Prime Minister Moraji Desai. Public rally addressed by Mr. Biju Pattnaik Union Minister for Steel and Mines and Mr.N.M.Routray Chief Minister of Orissa.

10th May 1978 : Water level rises at Rohila.

1st June to : 30 days satyagraha & Dharana by People at dam site Rengali

12th June 1978 Police ordered by Govt. to intervene. People Tear-gassed,Lathi charged and dispersed from dam site by police. Heads of BNC arrested.

It was at this time that on 10th May 1978, the water level of the river near Rohila was rising fast. Apprehending danger the people went to Rengali and found to their utter surprise that work on the coffer dam was progressing fast. This was too much for them. So the next day people form the nearby villages spontaneously grouped near the dam and stopped the Engineers from working. They continued to stage a dharana and satyagraha at the dam site even without the instructions of the leaders of the BNC. Subsequently mass meetings were organised and people were coerced with threats both moral and physical to come and join the satyagraha. By May 22nd 1978 at least 20 thousand people had gathered at the dam site and the "Steering committee" of the BNC now knowing that the project would never be closed demanded that the construction continue only after rehabilitation. The government turned deaf ears to this and in the fist week of June 1978 asked the leaders to withdraw the satyagraha but without success. It was now 3 day since the satyagraha has started and the governments patience was losing it, patience. On 10th May 1978 it ordered on OMP Platoon to cordon off the dam site. Though the leaders of the BNC tried to recruit more people to the struggle by 12th morning the entire dam site was cordoned off by the police and when the people tried to break it they were tear-gassed and lathi charged. Supposing that it was a bomb the rural mass fled in fear. The leaders were then arrested. Soon the police patrolled the villages and kept a vigilant eye on the people. So that they did not march to the dam. Thus ended one of the most prolonged people's movement in Orissa. It was an unhappy affair that there was division of interest among leadership and betrayal by some of them when they came to power. On analysis, it is found that conflicting interests among the capitalists and feudal landlords breached the movement. The capitalists needed the dam to provide them with power for industrial development/production and to save the Urban area from floods. On the other hand, the feudal interest lay in retaining their control over the land and its labouring households by opposing the dam. Moreover, the local leadership of the movement (vested in the landed elite) when it came to power sided with the industrialists/capitalists and marginalised the common mass who had set their hopes on them. The agitation thus ended with nothing on its hand, neither the shelving of the dam or a better rehabilitation package.

UPPER INDRAVATI : ANOTHER TRAGEDY

Commissioned in 1978 and begun with World Bank aid in 1979 the project located at the borders of Kalahandi and Koraput districts, is primarily being designed to irrigate the drought affected Kalahandi district. This original purpose has been superseded by power generation. And unlike in other hydroelectric projects the water flowing through the power house is stored in a vast and deep reservoir. This process will once and for all alter the courses of the four perennially flowing rivers and create a huge dry area.

Water Logging & Salination : The introduction of too much water into the command area beyond its natural drainage capacity which has a high ground water potential could cause a rise in the water table and lead to water logging of large areas. Again, black cotton soil in the command area has a high water retentivity capacity and is hence more vulnerable to water logging. Closely related to water logging is salinity. In areas of less rainfall, the earth contains a large amount of unbleached salt and when such a soil is irrigated it brings the salt to the surface and as the water evaporates it leaves behind a whitish residue of salt. This could be the case with the irrigation of drought prone Kalahandi.

Siltation : The massive deforestation of the catchment area of Indravati river will cause heavy siltation threatening the project. A detailed analysis of the catchment problems is presented in the Land Chapter.

Escalating Costs : As with any other project the cost of UIMP has been ever increasing. It was estimated to be Rs.208.15 crores in 1978, Rs.611.00 crores in 1984, Rs.954.10 crores in 1990 and Rs.1200 crores in 1993. By the time the project is completed the cost might rise still further.

INDRAVATI STRUGGLE

The very first phase of displacement in 1989 was followed by formation of a frontal organisation of the DPs. However, the leadership of the organisation was soon usurped by unscrupulous politicians who duped and harassed the DPs in connivance with the government officials. This phase of the movement was a failure by all account, and it was not until the Indravati Gana Sangharsh Parishad (IGSP) was formed in 1990 under the leadership of Advocate N.Ahmmed, with active support from Ganatantrik Adhikar Surakshya Sangathan (GASS). A particularly heartening feature of the Indravati struggle was the active participation of workers employed in the project, who stood to lose rather than gain by joining the movement.

Leaders of Indravati Project Workers' Union like Dayanidhi Sahoo, Debendra Naik, Ajit Baitharu and Abani Patnaik pledged unconditional support to the struggle of the DPs.

In June, 1990, IGSP organised a unique protest by leading a rally of about 5,000 domestic animals. Women's participation in this phase of movement was most remarkable. During this month, women workers and DPs held one demonstration in front of the G.M. Office at Khatiguda to highlight the problems of the dry area caused due to this project. In January, 1991, a two-day Seminar was organised by IGSP at Khatiguda, to discuss "Big dams and displacement". This programme was sponsored by Malkangiri Adivasi Sangh, Nawrangapur Adivasi Sangh and Upper Indravati Project (UIP) Workers' Union. Eminent academicians, freedom fighters, tribal leaders, NGO activists and representatives of the DPs attended the seminar.

In the following month, a total bandh was observed at Khatiguda in which the local market committee played a leading role. Workers from other states employed with the contractors also joined in. A batch of 20 women activists of IGSP, led by Mrs. Nayana Majhi announced its decision to take "*Jalsamadhi*" (Self immolation by jumping into the reservoir) on 5th March, 1991. A threatened state Govt. started negotiations with the leaders of the IGSP and promised to fulfill some of the demands. Thousands of workers, adivasis, peasants, business communities along with DPs marched through the street in victory celebrations.

The movement was to soon take a different turn. Due to criminal negligence of the project authorities and contractors, millions of causes of water rushed through the tunnels at Mahulpatna in August end, 1991. According to the government, 16 workers were killed in this disaster though the real figure is believed to be many times that number. This incident prompted a large section of the workers to join hands with the DPs.

Tunnel Disaster in Indravati.



Pix : Mr.Prithiraj, Khatiguda.

People's Resistance and Cows Rally against Indravati Project.



Pix : Mr. Prithiraj, Khatiguda.

In the first week of October, 1991, GASS and CPSW formed a Fact Finding Team under the Chairmanship of Mr.Guru Mohanty, a prominent civil liberty activist which reported the magnitude of negligence, corruptions and callousness of the project authorities not only in causing this disaster, but also in implementing rehabilitation and resettlement of the DPs. And then, in December, 1991, CPSW and GASS organised a state-level workshop on "Big Dam Policy, role of World Bank and displacement" at Bhubaneswar. Mrs. Rajani X.Desai, Convenor AIFOFD, Mr.S.K.Roy, Prof.Manoranjan Mohanty and many other prominent personalities spoke against Big Dam Policy and role of World Bank in the so called developmental projects in the Third World. In the workshop, after listening to the bad impact of Big Dams, the activists decided to oppose the dam. One formula was worked out to demand small small dams in the same situation and keeping the plans as it is.

A campaign Padayatra was organised around the 110 sq.km reservoir area covering 21 Grampanchayats of both the districts from 24.01.92 to 14.02.92. On the concluding day a mammoth public meeting was organised at Kunimunda, near Khatiguda, where speakers pilloried the Big Dam Policy in general and UIMP in particular. It was resolved in this meeting to launch a protracted struggle of the DPs and workers from March 5th, 1992. However, this could not go to all corners and displacement issue dominated in the minds of people.

On March 5 and 6th, Sri Banka Behari Das, President Orissa Krusak Mahasangh spoke in public gatherings at Mukhiguda of Kalahandi and Kathargada of Koraput & called the people to participate in and assist the just struggle of the DPs. After this, each day was marked by rallies, dharanas and demonstrations till 3rd April 1992. On 3rd April, 1992, an indefinite strike and seizure of work started in all four dam areas and at Mukhiguda Power house. DPs project workers and workers working under various contractors compelled the authorities to close work at Muran, Podagad, Kapur, Deopalli, Mahulpatna and Mukhiguda. Batches of DPs picketed at the construction sites and stopped work for five consecutive days.

The movement got momentum when hundreds of adivasis from the dry areas and project workers joined the DPs. UIMP Workers Union had a one day token strike on 3.4.1992, both at Khatiguda and Mukhiguda in support of the movement. On 7th April 1992, the police arrested 28 prominent agitationists and sent them to Nawarangpur jail. In the afternoon when hundreds of DPs, adivasis and local people were demonstrating in front of Khatiguda P.S. against such indiscriminate arrest and torture, they were lathicharged. About a hundred of them were injured including about 30 women. Later in the day Mr.N.Ahemmad, President of IGSP was also arrested and tortured. All the arrested were sent to judiicial custody till Apriil 12,'92.Their bail petitions were neither granted nor rejected, but kept in abeyance till 12th April, without any rhyme and reason.

This was the first tiime in Orissa when people from various sections including working class, NGOs, joined in the movement. The movement went through several ups and down. The compensation and rehabilitation was comparatively better.



Pix : Mr.Prithiraj, Khatiguda.

People's Resistance and Cows Rally against Indravati Water Resource Development Project.

EVER ESCALATING CONSTRUCTION COSTS

The construction of dams not only cause displacement of a number of people as per table-10, but also continue to increase in costs as seen in table - 11. Facts reveals that the cost of irrigating one hectare of land through a big dam is about Rs.36,000, with which 36 small structures each costing Rs.1,000 can be created.

Table - 11 : Cost Analysis of few Big Dam Projects

Name	Period	Estimated & Actual cost (in crores)	Total Irrigation Potential (in hac)
Anandapur Barrage	1977-78 Ongoing	15.98-16.26	50,220 (K) 40,178(R)
Poteru Project (Irrigation)	1972-73 Ongoing	14.81-88.88	600 (Orissa) 61,038 (A.P)
Rengali Multipurpose Project	1973 Ongoing	41.92-232.37	—
Rengali Irrigation Project (Samal)	1978 Ongoing	707.39-1475.53	—
Upper Kolab Multipurpose Project	1976-1988	58.97-272.92	—
Upper Kolab Irrigation Project	-do-	16.46-160.00	47,715 hectare
Upper Indravati H.E. Project	1979 Ongoing	165.41-706.22	—
Upper Indravati Irrigation Project	1979 Ongoing	42.74-338.17	1,09,300 hectares
Subarnarekha Irrigation Project	1978 Ongoing (Orissa Share-223.30)	31.43-642.87	109,000 hactere irrigation due to Ichha Dam Orissa part)

COST ANALYSIS OF FEW MEDIUM PROJECTS

Besides the very large negative impact of the mega projects, the medium projects are also not very cost-effective. Moreover these projects suffer more from maintenance point of view. Hence, the actual benefits the projects are yielding need proper study and assessment. The situation of few recent projects is presented in Table - 12

Table- 12 : Irrigation cost of Medium Projects

Name Pj & River Basin	Area Irrigated (in '000 hec) Kharif	G.C.A.	Year of Work	Cost in lakh
Bagh Barrage, Mahanadi	8.5	10.9	1984 - On going	2877
Dadraghati	4.5	5.1	1972 - 1988	1012
Baghalati, Bahuda	2.8	5.0	1984 - On going	2503
Talasara, Mahanadi	3.0	4.3	1978 - 1988	760
Sarafgarh, Mahanadi	2.2	3.2	1978 - 1987	817
Daha, Rusikulya	4.7	7.8	1975 - 1988	1536
Kuanria, Mahanadi	3.6	4.8	1977 - 1988	1307
Upp.Suktel, Mahanadi	1.0	1.9	1978 - On going	658
Kansabahal, Brahmani	4.6	7.2	1980 - On going	2911
Harabhangi, Vansadhara	9.1	12.8	1979 - On going	6913
Manjore, Mahanadi	4.1	5.7	——	2401

BRUSTING OF DAM

Neglect in maintenance of dams is fraught with danger to life, property, ecosystem and environment.

Pratapur Dam : Ghodsal is a tributary of Vansandhara. It originates in Langigarh hills of Kalahandi district. The river was dammed at Pratapur as a minor irrigation project. The Dam burst in 1978 and 1981, causing flash floods in Vansadhara in Gunpur subdivision. About 300 villages suffered from flood.

Tenar Dam : Tenar is a tributary of Ramial in Kamakshyanagar subdivision of Dhenkanal district. Tenar originates from Telkoi plateau of Keonjhar district. A minor irrigation project was completed in 1978. The Dám burst on October 5, 1983, causing flash flood in Ranial.

Hadagada Dam : There were leaks in the sluice gates. The wheels on which the gates slide broke and were not replaced. The Dam gave way in early 1988. The Dam is a danger to Bhadrak town. In the March 1994, Assembly Session members expressed serious anxiety about the blasting near the Dam site for mining purpose. This needs serious monitoring.

The Danger & Insecurity of Hirakud : Cracks have already appeared in Hirakud Dam. This is partly due to improper curing of concrete at the time of Construction of the dam and partly to water pollution of the Ib. Alkalinity of water aids in development of cracks. Recently Rs.50 crores was received from World Bank for the repair work. Yet in other countries, disaster preparedness, is not adhered to in Hirakud. The life of people, downstream of Hirakud, is therefore extremely insecure and in case of an accident at Hirakud, the results will be fatal

NOW, COMMAND REHABILITATION NEEDS HUGE ALLOCATIONS

Unless, the command areas are properly rehabilitated with adequate drainage facilities, most of our fertile lands will go waste. A massive investment is required to remove drainage congestion. During the last part of 7th Plan to stabilise irrigation in only 28,500 hectares of command area Rs.385 lakhs were spent under the irrigation advancement programme. To remove drainage congestion, Rs.1570 lakhs has been allocated under the 8th Five Year Plan. A massive scheme of Rs.600 crores for development of Mahanadi Delta (of which Rs.199 crores is meant for removal of drainage congestion) has been prepared to seek World Bank Assistance. The planners have yet to estimate how much it is going to cost to treat all the commands of the state. On the other hand, by investing this much money, lakhs of hectares in drought prone areas could have been provided protective irrigation.

Field Channels & Drains : Without development of channels and drains, the irrigation water is not optimally utilized. For example, 5 irrigation projects in Orissa having a C.C.A of 6,01,600 hectares, have an U.I.P. of 9,43,930 hectares. But so far, 2,80,565 hectares of land have been developed with field channels. Out of the remaining 3,21,035 hectares, it is proposed to cover 1,96,900 hectares in the 8th plan with a cost of Rs.1100 lakhs. For removing excess water from the crop fields and promoting multiple crop pattern, it has become essential to construct link and main canals on fields. A total outlay of Rs.444 lakhs has been made at a revised cost of Rs.3281 per hectare for the 8th plan period.

Creation of Regional Imbalance & Inequality : The impact of big dams and centralised water and energy policies of several nations are being criticised world wide. Such projects have turned South Orissa into a desert. Moreover, these projects which are undertaken under the Tribal sub-plan programmes rarely benefit the tribals. Being situated on the hill slopes, tribal lands are hardly irrigated. Nor do tribal areas get electrification. Rather, the projects result in deforestation of large areas and create soil-moisture stress. They are also responsible for creating regional imbalances. The projects boost up the economy in the command area while affecting other erstwhile fertile areas. For example the Hirakud command adversely affected the rich and prosperous

farmers of Kalahandi and Bolangir. More inputs, marketing facilities, labour migration and occasional droughts made cultivation in Kalahandi uneconomic and a gamble. Hence, people preferred to drop cultivation and the ultimate result was more disastrous. Another trend found in the Hirakud command was that peasants who were unable to invest so much on agriculture, started selling their lands to Telger and Marwari people. As a result many became landless and marginal farmers.

Most of the mega dams thus create serious regional imbalance and inequality. In many cases, the people of the respective areas are deprived of water resource, whereas people in other areas get the benefit. Even in a locality or in a village, some people get the benefit where as others face water scarcity. This leads to a lot of social tension and political unrest. In Orissa, there is a lot of tension between West and East. The actual areas irrigated by some of these mega projects is presented below.

Table - 13 : Project district and Irrigated Areas

Project	District in which situated	Irrigation created (in hec)	Irrigation Potential created in other districts/area
Salandi	Keonjhar	10	Anandpur, Boudh, Bhadrak dists.
		18,180 (Rabi)	Tihidi & Basudevpur blocks
Upp.Indravati	Koraput	3,910	Dharmagarh
(to be created)		1,09,300	Kalahandi district
Hirakud	Sambalpur	1,10,760 (Kharif) + 76,260 (Rabi)	Bargarh & Kuchinda bolcks only
(Water not adequately Supplied)		42,480 (Kharif) + 21,650 (Rabi)	Binika and Dunguripalli blocks
Mahanadi Delta Stage - II		1,52,660 (Kharif) + 1,08,800 (Rabi)	Bhubaneswar & Puri Sub-divisions
Rengali Irrigation Project	Dhenkanal	57,484	Dhenkanal & Angul Area
(To be created)		1,15,429	Cuttack (old), MainlyJajpur & Athagarh area
		18,173	Balasore area
		16,014	Anandpur area, Keonjhar dist.
Subarnarekha,	Mayurbhanj	94,655 (Kharif)	Baripada division of
(to be created)		59,890 (Rabi)	Mayurbhanj district
"		14,972 (Kharif)	Basta Block of
		3,190 (Rabi)	Balasore district.

FUTURE IRRIGATION DEVELOPMENT : PROBLEMS & PROSPECTS

Taking into account the present costs of irrigation, it is estimated that the future projects (proposed) will require not less than Rs.10,000 crores. Besides, the 4-major ongoing and other projects have been allotted Rs.2276 crores during 8th plan alone. For completion of all ongoing projects, not less than another Rs.1500 crores will be required. Hence, this total of Rs.13,500 crores for such projects can be reduced by 50% and more effective and sustainable land and water management with forestry, pisciculture, animal husbandry etc. can take place effectively for 40,000 sq.kms of agriculture lands. The choice lies with planners but what is definitely needed is a more scientific approach policies and plans by the government.

Table - 14 : Ongoing and Future Irrigation Potential

(area in '000 hectares)

		M & M Projects	M.I.P(flow)	M.I.P(lift)	Wells
1.	Total Irrigation Potential (Ultimate)	3949	0988	650	1621
2.	Irrigation Potential Created (Completed projects till 1989-90)	0829	0496 (Certified ayacut is 355 thousand hectare)	250 *	275
3.	Irrigation Potential of Ongoing Projects	0958	0047 (1990 onwards/ 8th plan, 1990-97)	—	Not significant
4.	Irrigation Potential of Future Projects	2162	0345	400 **	1346

* - Approximate Figure ** - On-going and Future added together

REVIEW OF ONGOING & FUTURE PROJECTS

But after so much of debate and public awareness, the 8th Five Year Plan strategy don't show any shift in thinking. Rather top priority is given to complete the ongoing 4 projects only with an investment of Rs.2276 crores of rupees. Their is a strong need to review the ongoing M & M projects in the state. In case of Narmada, few experts came out with a compromising formula of reducing the height of the dam. It was found that slightest reduction in the height of the dams can save a lot of Environmental, Social and Financial costs. In a seminar organised on Big Dams & World Bank policy at Bhubaneswar on December, 1992, Experts, Activists and NGOs were of the opinion that, Indravati Project can be split into two parts to benefit both Koraput and Kalahandi districts. Hence, there is an urgent need to review the existing projects and take some corrective measures. The height of some of the medium projects and their consequent impact on submergence/displacement presented Table-20 shows some co-relation. Though these are the officially stated figures, field studies have found a lot of discrepancy in them. Each case needs to separately examined and people should be given a chance to participate in the decisions.

Table - 15 : Review of some On-going Projects

Name of the Project	River Basin	Height of Dam	Length	Submergence/Displacement No. of village	No. of families	Forest land	Total land
1.Kanpur	Baitarani	36.018	3247	16	8600	235	2,600
2.Lower Indra	Mahanadi	33.000	4217	25	1460	965	4,500
3.Ong Dam	Mahanadi	26.000	1128	20	—	—	3,917
4.Lower Suktel	Mahanadi	36.000	1410	32	3092	600	5,216
5. IB	Mahanadi	—	—	29	8005	2466	14,000
6.Bankbahal	Subarnarekha	16.500	1900	18	282	16	1,456
7.Hariharjore	Mahanadi	18.500	2296	6	394	-	1,845
8.Pilasalu	Mahanadi	26.080	458	17	185	—	525
9.Baghra-III	Rusikulya	19.090	1600	9	589	—	869
10.Deo	Baitarani	31.700	1503	14	248	—	847.5

Besides the ongoing ones, it is important to stop the future projects which are being still designed or planned. The planning commission and other bodies must thoroughly examine the cost-benefits and alternative methods more suitable and effective in Orissa's context.

Manibhadra, to be built on Mahanadi River is one such future project that the Govt. of Orissa is planning. It is believed that the project can irrigate 3,58,000 hectare (CCA) in Cuttack district, 80,000 hectare (CCA) in Ganjam and 36,000 hectare (CCA) in Puri district (Nayagarh). But, the envisaged project could submerge lakhs of people and a number of important towns depending upon the final location and height of the dam.

There a number of such big and medium projects in the investigation, designing and planning stage. It is recommended that Social, Economic and Environmental costs and sustainability of each of these projects be studied, publicaly debated and only then, decisions be taken. The people who are going to sacrifice and the people for whose development all these projects are meant, must get a chance to participate in taking such decisions. Above all sustainable alternatives, with low costs and requiring short time periods to build, must be explored.

SMALL & MINOR IRRIGATION : THE NEGLECTED SECTOR

Tank Irrigation was providing Irrigation for more than 50%, Lands earlier, is totally neglected now.



Pix : Gandhi Peace Centre, Bhubaneswar.

Irrigation development slated towards mega dams and hydro-power has created an imbalance between the traditional sources of irrigation like tanks, natural drainage depressions, water bodies of the sort. Now this sector was irrigating more than 60% of the croplands in 1950s where as our total irrigated land is not even 30%, today. It's negligence has caused serious water scarcity in some areas whereas over emphasis on canal irrigation has resulted in water logging. There is therefore, a need for emphasis on small sector and integrated watershed management.

Table - 16 : Development of Minor Irrigation in Orissa

Sl. No. District	Flow Irrigation: Ultimate Potential Kharif	Rabi	Total	Potential created up to 1989-90 Kharif	Rabi	Total	Lift Irrigation: Ultimate Potential Tubewell	River lift	Potential created upto1989-90 Total	No.of LIP	Potential
01. Balasore	17400.58	5328.82	22729.4	7552	3496	11048	104175	24800	1,28,975	2258	42842
02. Bolangir	50640.44	10242.39	60882.83	15990	2327	18317	—	44500	44,500	224	7157
03. Cuttack	66535.67	15239.52	81775.19	18207	5003	23210	86920	49100	1,36,020	3060	66680
04. Dhenkanal	104392.77	16099.23	120491.5	32960	5206	38166	—	45800	45,800	479	14082
05. Ganjam	168540.07	17152.54	185692.6	91614	9793	101407	10000	21900	31,900	1075	20254
06. Kalahandi	60258.59	13036.81	73295.4	26139	6027	32166	—	56500	56,500	481	9967
07. Keonjhar	58291.38	14153.35	72444.73	17486	3302	20788	2170	28300	30,470	560	12354
08. Koraput	112970.42	25242.33	138212.7	31307	6284	47591	4375	119800	1,24,175	1046	22483
09. Mayurbhanj	72969.99	17366.37	90336.36	33841	3465	37306	8250	37100	45,350	620	12613
10. Phulbani	48468.13	14207.68	62675.81	16773	3968	20741	—	47000	47,000	221	6460
11. Puri	61275.69	14199.34	75475.03	30736	4464	35200	21420	49200	70,620	468	12791
12. Sambalpur	104312.42	18929.49	123241.9	32910	4348	37258	—	83600	83,600	552	14110
13. Sundargarh	61755.13	11784.57	73539.7	20604	3261	23865	—	42400	42,400	227	8524
Total	987810.78	192982.4	1180793.2	376119	60944	447063	237310	650000	8.87.310	11,271	2,70.317

SOURCE : OLIC, Bhubaneswar.

Small & Minor Irrigation projects developed can be effectively utilised.



Pix : Manoj K. Pradhan.

The latest assessment of the potential of minor irrigation (flow) schemes reveals that a total 5882 schemes can be constructed to irrigate 9.87 lakh hectares of Kharif and 2 lakh hectares of Rabi. So far, only 3,76,119 hectare Kharif and 60,444 hectare Rabi potential has been created in the state. The Orissa Lift Irrigation Corporation ensures setting up of public sector L.I Projects (tube wells and river pump units) in the state. As assessed by them, the ultimate potential is said to be 8,87,310 hectare in Kharif. Yet only a small percentage of 2,70,317 hectares has been created thus far. Besides this the vast potential of ground water has not been given serious attention. Interestingly the most water needy districts like Bolangir, Dhenkanal, Kalahandi, Phulbani, Sambalpur and Sundergarh are not found suitable for such projects.

GROUND WATER DEVELOPMENT : NEEDS TOP PRIORITY

Provision of irrigation facilities which is essentially required for the improvement of agriculture is dependent on surface and ground water resources. Considering all the negative impact of big dams and the huge reserve of ground water, the need for its use is felt to be the most desired development. The ground water potential of the state has been estimated as 23.279 lakh Hect.Mt. and by now all types of irrigation wells installed have created irrigation potential only for 2.75 lakh hectares. The vast unexploited ground water potential can be meaningfully utilised for the drought prone and backward areas.



Orissa's rich Ground Water potential is only developed in few areas. Over-exploitation must be regulated. →

Pix : Ghani Zaman for CPSW.



Pix : Ghani Zaman for CPSW.

Well Irrigation can reduce water logging and provide water for multi-crops as per their requirement with conservation capability.

It is estimated that the area coming under the hard rock terrain can sustain 8.50 lakh standard dug wells/bore wells /dug-cum-bore wells to create irrigation potential for 10 lakhs hectares. The area coming under the semi-consolidated type of formation constitute about 2% of the gross area of the state. In such areas sand stone and shale occur alternately. Sand stone constitutes the main aquifer for open wells, dug-cum-bore wells or low yielding tubewells installed. Shale when it occurs at the ground level, provides little scope for installation of open wells. Only in a few cases, shale is also fractured and holds a limited quantity of ground water which is tapped by open wells. The surface topographical feature of the area coming under sedimentary tract is either plain or it is sloping towards a valley. The Athagarh-Bhubaneswar tract, the Chhendipada-Angul-Talcher-Kanika tract, the Jharsuguda-Laxmanpur tract, the tertiary tract of Baripada, the Salebhata area of Bolangir etc. comes under the semi-consolidated sedimentary formation which has scope for low yielding medium deep tubewells, dug-cum-bore well and open wells.

Table - 17 : Status of Ground Water Development in Orissa

Sl No.	Name of the Districts	Present net annual draft	Balance utilisable G W	Level of G W development (in percentage)	Feasibility of Irrigation Wells Dug wells with Tenda	Dug wells with Pumpset	Bore wells
01.	Balasore	39389	98783	28.50	1631	15403	2494
02.	Bolangir	7395	98382	6.99	20000	52168	1245
03.	Cuttack	24159	163856	30.51	9625	586	1896
04.	Dhenkanal	6826	106603	6.02	—	43702	
05.	Ganjam	15384	106569	12.61	33034	3696	1048
06.	Kalahandi	4516	66632	6.34	18158	992	53493
07.	Keonjhar	3317	81265	4.00	71000	400	
08.	Koraput	5607	220326	2.48	—	248	6223
09.	Mayurbhanj	4150	65760	3.60	7195	340	—
10.	Phulbani	4870	154280	—	5012	—	—
11.	Puri	854	213474	3.68	22659	1174	44
12.	Sambalpur	6475	211116	2.97	25948	1427	13
13	Sundergarh	6466	75581	5.65	267024	64085	—

SOURCE : OLIC, Bhubaneswar.

These irrigation wells, till the period mentioned utilised only 5.34% of the utilisable ground water potential available in the state. The dug wells and filter point tubewells installed till the period mentioned have created irrigation potential for 1.023 lakh hectares during Kharif and 0.613 lakh hectare during Rabi. The development of the balance unutilisable potential involves capital expenditure of Rs.2600.00 crores approximately (at the existing rates of materials, labour etc.) which can be availed by the cultivators in the shape of institutional finance.

A small farmer with little investment can protect the crops from drought.



Pix : Jagadish Pradhan.

Most of Koksara, Jayapatna and Koraput Blocks have high ground water potential zones. Only Junagarh, Bhawanipatna and Deogarh have low potential. Indravatin dam can irrigate the low ground water areas like Dharmgarh, Bhawanipatna and Junagarh but at the same time, will create water logging on the high ground water areas such as Jayapatna, Koksara and Kalampur belt. The Junagarh, Bhawanipatna and Dharmgarh could have been irrigated by Upper Tel WHS with moderate degree of success and if at all any engineering skill is available, the high elevation of Indravati could have been used to divert water directly to Bhawanipatna, Junagarh and Dharamgarh areas while Jayapatna, Koksara, and Kalampurcould have been irrigated with ground water lifting. In absence of this the entire rice bowl is going to be salinised and waterlogged.



Pix Sanjay K. Khatua

Traditional method of irrigation was most scientific and environmental friendly.

TRIBAL & DROUGHT PRONE AREAS : NEED FOR A SUSTAINABLE APPROACH

One who really understands the topography, soil, geo-morphology, climate and rainfall, vegetation of different agro-climatic zones and the state of environmental degradation that has been caused by such big projects in the past in different areas and experience in terms of land slides, tunnel disaster, seismicity, water logging and salination etc. can never promote big dam technology and create so much of regional imbalance, inequality and injustice in the name of development. Orissa's Tribal and Drought prone areas are of special nature and the problems require special treatment. The problems of these two types of areas are dealt in two different chapters of this report. But the belief that our technocrats and engineers have answers to our problems of water management and Agriculture Development is over-emphasized. Instead of learning from people, our engineers value "Biggism" and Western Technology which adds value to their discipline. Even when, westerners have changed their science and technology due to pressure or advancement of knowledge, our science does not change. Our value orientation towards what is really "scientific", sustainable and what really promotes "just" & "equitable" social development is undermined by the strong vested interests. Democratic Governments in the name of promoting National Development don't realise the harm that is caused in the process. Methods, technologies and systems which are appropriate, that which promote equity and make it sustainable in the long run are very much advocated today. Integrated watershed management is most effective and appropriate in this context.

Equity in Irrigation Development ? A bird's eye view of the drought prone areas of Orissa, namely, undivided Kalahandi and Phulbani districts, Malkangiri and Umerkote of undivided Koraput; Padampur sub-division of Sambalpur district (undivided), Patrapur and Jarada areas of Ganjam district and Athamalik area of Dhenkanal district are not provided with irrigation though for years they have been established as drought prone areas of the State. On the other hand, districts with good irrigation potential are equipped with a good irrigation system (refer Table below), resulting in waterlogging. This inequity has to be set right not only at the macro level but also at the micro level that is regional, local and village level.

THE NEW WATER POLICY OF WORLD BANK

There is some rethinking at the World Bank level, though the National Govt's still persue the same line. On September 14, 1993, after two and a half years of preparation, the World bank publicly released its new Water Resources Management Policy Paper. For the communities, organisations, and activists affected by or concerned about the impact of Bank lending for water projects the question arises : Will this new bank policy bring about real changes in Bank practice ?

The Bank began working on the water policy, after it became impossible to deny the widespread failure of its water lending program to satisfy even the Bank's own narrow economic criteria, let alone addressing the urgent problems of lack of access to clean water and widespread environmental degradation. For example, a 1989 report by the Bank's internal Operations Evaluation Department (OED) found that fewer than half of Bank-funded irrigation projects were "satisfactory" at full development and that agricultural productivity had actually declined in 43 percent of projects evaluated.

Then in 1991 the India Irrigation Sector Review delivered a scathing critique, stating that "with rare exception, there is no justification in the medium term for new surface irrigation investments", the staple of Bank lending to its largest borrower. Similar failures were documented in a 1992 OED review of water supply and sanitation lending. Of course the Bank was already on the defensive for its financing of disastrous projects such as India's Sardar Sarovar Dam, Indonesia's Kedung Ombo Dam and Itaparica Dam in Brazil. The Bank finally relented and agreed to hold a consultative "workshop" after it received many letters on the water policy from NGOs all over the world. The meeting was held in Washington D.C. on May 28-29, 1992, and was attended by representatives of 18 NGO's, half of whom were from borrowing countries, plus five industry representatives and more than 20 Bank staff. The NGO representatives agreed on four key points which they demanded the Bank incorporate into its policy.

The Final Policy Paper : The World Bank has two major and potentially conflicting "guiding principles" : a comprehensive approach to water resource planning and increased privatization and decentralization of water service delivery. The policy paper begins by painting a fairly realistic picture of the tremendous problems of mismanagement, and lack of accountability that plague the water sector in developing countries. An acknowledgment of the Bank's role in creating and exacerbating these problems is conveniently lacking from the policy document. The policy paper then outlines the concepts of comprehensive analysis, water pricing, market mechanisms and praises in general terms water conservation and demand management, user participation, and environmental protection and restoration. But in the final and the most important section, "Role of the World Bank", the policy fails to clearly state how bank lending for water will change.

NGO POSITIONS ON WATER POLICY

NGO positions at the May 1992 meeting with the World Bank for sustainable and equitable development can be summarised as follows :

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Public Participation : Community control and management of water require public participation in sector planning and all subsequent stages of water management and development. The participants should include, NGO's, water users, all affected people and society at large.

Sustainability : Prioritize environmental restoration; maintain ecological integrity of entire river basins; value ecological water uses such as fisheries and wetlands, incorporate long-term impacts and decommissioning costs, emphasize pollution prevention over treatment, require cost recovery to cover at least operations and maintenance expenses, with life-line raters, especially for urban poor.

Implementation : Require total accountability and transparency in Bank operations and in Bank funded projects and programs; enforce existing Operational Directives on environmental assessment, displaced populations, indigenous peoples, etc., invest in capacity building for public participation, community management, comprehensive approach to water resources management, attach loan conditionalities to require utilization of alternatives, public participation and sustainability.

An analysis of irrigation potential creation district-wise and fund allocation to different sectors plan-wise is presented in Table - 18

Table - 18 : District-Wise Irrigation Development till 1989-90

District	Total cultivated area	M & M Projects	Minor (flow)	Minor (lift)	Total	% of the total cultivated area
Balasore	457	87,720	7,552	42,842	138,114	30.22
Bolangir	465	52,390	15,990	7,157	85,537	18.39
Cuttack	737	2,04,790	18,207	66,680	2,89,677	39.30
Dhenkanal	478	21,340	32,960	14,082	68,382	14.30
Ganjam	505	1,02,450	91,614	20,254	2,14,318	42.43
Kalahandi	514	18,060	26,139	9,967	54,166	10.53
Keonjhar	319	26,430	17,486	12,354	56,270	17.63
Korapul	925	43,870	31,307	22,483	1,04,660	13.31
Mayurbhanj	447	32,949	33,841	12,613	79,403	17.76
Phulbani	240	22,260	16,773	6,460	45,493	18.95
Puri	489	1,81,160	30,736	12,791	2,24,687	45.94
Sambalpur	668	1,26,560	32,910	14,110	1,73,580	25.98
Sundargarh	315	9,880	20,604	8,524	39,008	12.38
Total	6,559	9,29,859	3,76,119	2,50,317	15,73,295	23.98

Table - 19 : Investment under different sector

Sl. No.	Plan Period	Investment made (in Rs. Crores) M & M Projects	Minor (flow & Lift)
1.	Preplan period	—	—
2.	1st plan (1951-56)	55.28	NA
3.	2nd plan (1956-61)	20.00	1.65
4.	3rd plan (1961-66)	26.22	6.22
5.	Annual Plans (1966-69)	20.44	7.95
6.	4th plan (1969-74)	20.89	18.18
7.	5th plan (1974-78)	70.63	31.00
8.	Annual plans (1978-80)	67.81	28.30
9.	6th plan (1980-85)	360.00	85.00
10.	7th plan (1985-90)	623.61	177.15
11.	Annual plans (1990-92) (Anticipated)	404.74	103.50
12.	8th plan (1992-97) (Targeted)	2276.00	323.40

INTEGRATED WATERSHED MANAGEMENT

Today, it is gratly realised to go for integrated management of all natural resources to its optimum so as to meet the various needs of the people and maintain the ecological balance of that area. The boundaries of a watershed are delineated on the basis of catchment of a small or big stream.

Watersheds of Orissa :The All India Survey and Land Use Society (AISLUS) has divided India into 6 water resource regions, 35 river basins, 112 catchments, 500 sub-catchments and 3237 watersheds. Orissa occurs in the water resource region - 4. Major basins which forms part of this region are Godavari, Mahanadi, Brahmani, Baitarani and Vanshadhara-Nagavali. Each basin has been divided into several catchments and each catchment into sub-catchments. Finally each sub-catchment has been divided into several watersheds.

The Orissa region has been divided into 159 watersheds, each consisting of several thousand hectares. The watershed map shows the status quo of all these watersheds.

Irrigation in Drought-Prone areas - A Case study of Kalahandi district : Irrigation in drought prone areas is being taken up on a priority basis. A number of mega irrigation or multipurpose dam projects are being planned to irrigate more number of areas. One such case is Raul-Vtei Dam, proposed in the M.Rampur areas. The dam will be extending several kilometers in length and width, will displace tribals, and destroy the dense forest areas of M.Rampur. It will irrigate parts of Kesinga, Narla and Karlamunda blocks, which have good water potential of moderate to good yields. This irrigation area comes under Utal (G1E6) and G1E4 watersheds, where integrated management using ground water and Water Harvesting Structures (WHS) could be very well undertaken by people. More WHS's will lead to more recharge of ground water, though surface evaporation will be enhanced.

WHS's are the best alternative to major and medium projects. For example, the Upper Jonk project which was designed to irrigate parts of the Nawapada block submerged many villages along with the historical and archeologically important sites of Maragurha Valley. This could havve been prevented by a series of water harvesting structures and ground water lift points at the Kotak (G1E7) and U.Ong.Kumre (G1D9) watersheds. Similarly the Upper Udanti Project (Proposed) could be shelved to allow Udanti (G1G2), (G1G1), Indira (G1F8), Undora (G1F7) watersheds. These are essential changes as the place has high ground water potential and is liable to get waterlogged if it is irrigated by canals.

Indravati dam is a case in point. It seeks to irrigate Junagarh, Dharramgarh, Kalampur and jayapatna blocks. Yet even before the dam is complete, it has displaced thousands of persons and taken several lives in a tunnel disaster. A number of big dams could have been done away with if U.Tel-Nowel (G1G6), Amar G1G5, Hulti (G1G4), U.Indravati Golad E2G6, Sogoda G1G3, Ret G1E8, watersheds could have been developed with integrated watershed management. Besides, developed arid land farming could have been used for low water areas such as Bhawanipatna, Dharamgrh and Junagarh areas while commercial crops could have been undertaken in southern blocks. As there are enough drainage lines where much rain is received, many WHS's could be constructed. More WHS could have increased more uniform recharge.

Overall, Integrated Management of all sorts of natural resources on a watershed basis can satisfy all the needs of the local people and make the development sustainable. It specially could regenerate the eco-system in drought prone area like Kalahandi. This should be considered on a priority and urgent basis.

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One who really understands the topography, soil, geo-morphology, climate and rainfall, vegetation of different agro-climatic zones and the state of environmental degradation that has been caused by such big projects in the past in different areas and experience in terms of land slides, tunnel disaster, seismicity, water logging and salination etc. can never promote big dam technology and create so much of regional imbalance, inequality and injustice in the name of development. Orissa's Tribal and Drought prone areas are of special nature and the problems require special treatment. The problems of these two types of areas are dealt in two different chapters of this report. But the belief that our technocrats and engineers have answers to our problems of water management and Agriculture Development is over-emphasized. Instead of learning from people, our engineers value "Biggism" and Western Technology which adds value to their discipline. Even when, westerners have changed their science and technology due to pressure or advancement of knowledge, our science does not change. Our value orientation towards what is really "scientific", sustainable and what really promotes "just" & "equitable" social development is undermined by the strong vested interests. Democratic Governments in the name of promoting National Development don't realise the harm that is caused in the process. Methods, technologies and systems which are appropriate, that which promote equity and make it sustainable in the long run are very much advocated today. Integrated watershed management is most effective and appropriate in this context.

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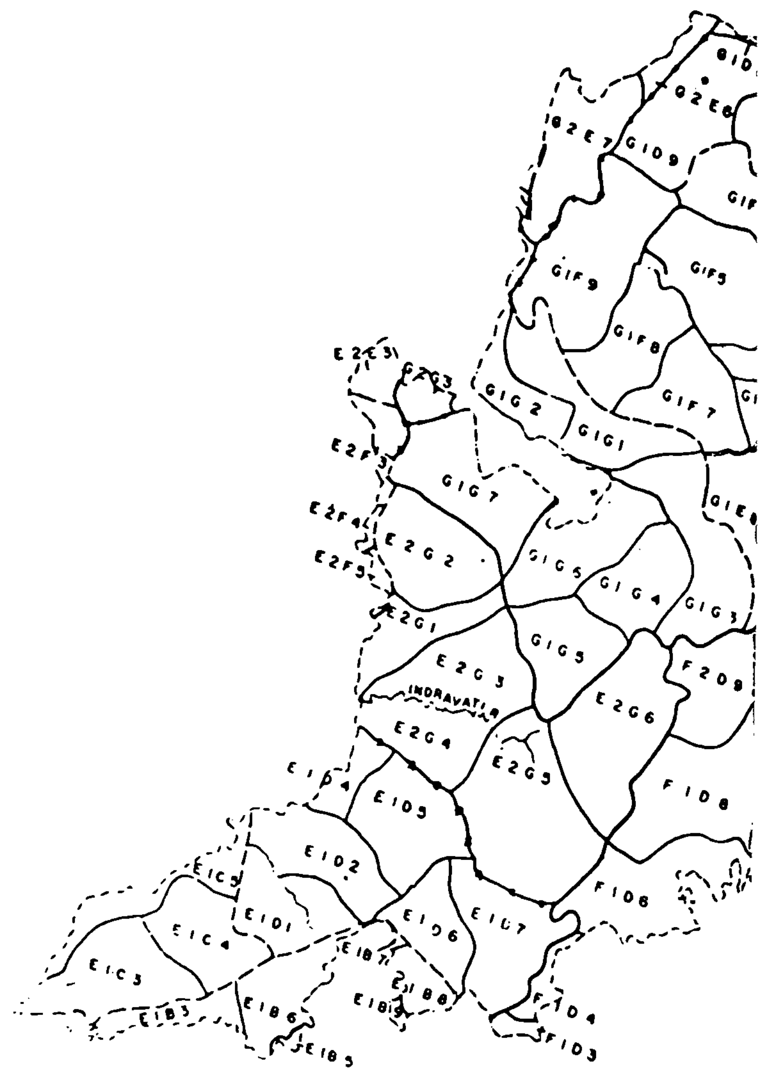
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District	Total cultivated area	M & M Projects	Minor (flow)	Minor (lift)	Total	% of the total cultivated area
Balasore	457	87,720	7,552	42,842	138,114	30.22
Bolangir	465	52,390	15,990	7,157	85,537	18.39
Cuttack	737	2,04,790	18,207	66,680	2,89,677	39.30
Dhenkanal	478	21,340	32,960	14,082	68,382	14.30
Ganjam	505	1,02,450	91,614	20,254	2,14,318	42.43
Kalahandi	514	18,060	26,139	9,967	54,166	10.53
Keonjhar	319	26,430	17,486	12,354	56,270	17.63
Koraput	925	43,870	31,307	22,483	1,04,660	13.31
Mayurbhanj	447	32,949	33,841	12,613	79,403	17.76
Phulbani	240	22,260	16,773	6,460	45,493	18.95
Puri	489	1,81,160	30,736	12,791	2,24,687	45.94
Sambalpur	668	1,26,560	32,910	14,110	1,73,580	25.98
Sundargarh	315	9,880	20,604	8,524	39,008	12.38
Total	6,559	9,29,859	3,76,119	2,50,317	15,73,295	23.98

INTEGRATED WATERSHED MANAGEMENT



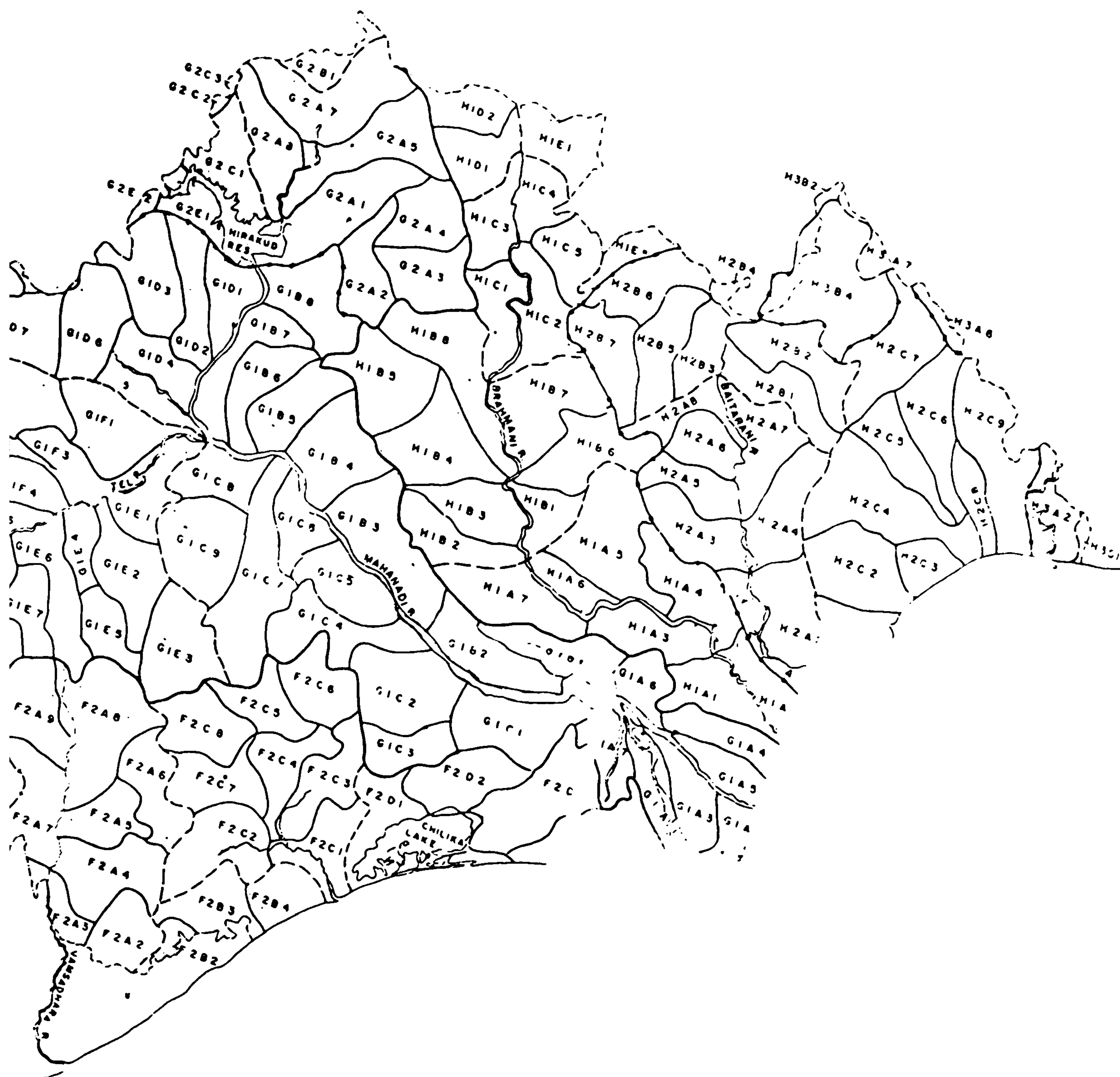
Today, it is gratly realised to go for integrated management of all natural resources to its optimum so as to meet the various needs of the people and maintain the ecological balance of that area. The boundaries of a watershed are delineated on the basis of catchment of a small or big stream.

Watersheds of Orissa :The All India Survey and Land Use Society (AISLUS) has divided India into 6 water resource regions, 35 river basins, 112 catchments, 500 sub-catchments and 3237 watersheds. Orissa occurs in the water resource region - 4. Major basins which forms part of this region are Godavari, Mahanadi, Brahmani, Baitarani and Vanshadhara-Nagavali. Each basin has been divided into several catchments and each catchment into sub-catchments. Finally each sub-catchment has been divided into several watersheds.

The Orissa region has been divided into 159 watersheds, each consisting of several thousand hectares. The watershed map shows the status quo of all these watersheds.

Irrigation in Drought-Prone areas - A Case study of Kalahandi district : Irrigation in drought prone areas is being taken up on a priority basis. A number of mega irrigation or multipurpose dam projects are being planned to irrigate more number of areas. One such case is Raul-Vtei Dam, proposed in the M.Rampur areas. The dam will be extending several kilometers in length and width, will displace tribals, and destroy the dense forest areas of M.Rampur. It will irrigate parts of Kesinga, Narla and Karlamunda blocks, which have good water potential of moderate to good yields. This irrigation area comes under Utal (G1E6) and G1E4 watersheds, where integrated management using ground water and Water Harvesting Structures (WHS) could be very well undertaken by people. More WHS's will lead to more recharge of

WATERSHEDS OF ORISSA



Source : Watershed Atlas of India.

Table - 19 : Investment under different sector

Sl. No.	Plan Period	Investment made (in Rs. Crores) M & M Projects	Minor (flow & Lift)
1.	Preplan period	—	—
2.	1st plan (1951-56)	55.28	NA
3.	2nd plan (1956-61)	20.00	1.65
4.	3rd plan (1961-66)	26.22	6.22
5.	Annual Plans (1966-69)	20.44	7.95
6.	4th plan (1969-74)	20.89	18.18
7.	5th plan (1974-78)	70.63	31.00
8.	Annual plans (1978-80)	67.81	28.30
9.	6th plan (1980-85)	360.00	85.00
10.	7th plan (1985-90)	623.61	177.15
11.	Annual plans (1990-92) (Anticipated)	404.74	103.50
12.	8th plan (1992-97) (Targeted)	2276.00	323.40

WHS's are the best alternative to major and medium projects. For example, the Upper Jonk project which was designed to irrigate parts of the Nawapada block submerged many villages along with the historical and archeologically important sites of Maragurha Valley. This could havve been prevented by a series of water harvesting structures and ground water lift points at the Kotak (G1E7) and U.Ong.Kumre (G1D9) watersheds. Similarly the Upper Udanti Project (Proposed) could be shelved to allow Udanti (G1G2), (G1G1), Indira (G1F8), Undora (G1F7) watersheds. These are essential changes as the place has high ground water potential and is liable to get waterlogged if it is irrigated by canals.

Indravati dam is a case in point. It seeks to irrigate Junagarh, Dharramgarh, Kalampur and jayapatna blocks. Yet even before the dam is complete, it has displaced thousands of persons and taken several lives in a tunnel disaster. A number of big dams could have been done away with if U.Tel-Nowel (G1G6), Amar G1G5, Hulti (G1G4), U.Indravati Golad E2G6, Sogoda G1G3, Ret G1E8, watersheds could have been developed with integrated watershed management. Besides, developed arid land farming could have been used for low water areas such as Bhawanipatna, Dharamgrh and Junagarh areas while commercial crops could have been undertaken in southern blocks. As there are enough drainage lines where much rain is received, many WHS's could be constructed. More WHS could have increased more uniform recharge.

Overall, Integrated Management of all sorts of natural resources on a watershed basis can satisfy all the needs of the local people and make the development sustainable. It specially could regenerate the eco-system in drought prone area like Kalahandi. This should be considered on a priority and urgent basis.

ALTERNATIVE METHODS OF WATER RESOURCE DEVELOPMENT

Some innovative projects of Water Resource Development by NGO's and the government have been successful ones. Though marked by a difference in approaches, the key to the success of the projects by both the NGO's and the government lay in the participation of people in terms of their rights over the local resources and in decision-making. This is of course the key to development besides those very essential elements of sincerity, honesty and commitment.

PRADAN, a voluntary agency based at Purulia in West Bengal introduced a successful alternative method of rain water harvesting through the technique of insitu moisture conservation, soil conservation & land husbandry. The alternative consists of two models, namely the "Jaladhar" model practiced on unbunded and untraced uplands and the "Five percent" model practiced on medium uplands and medium lowlands.

In the first, in a plot of 1200 to 1400 sq.ft. a collection pit of 105 cubic feet is dug at the lower end of each plot & the earth excavated from it is used for bunding. A spill way of appropriate size is made for release of high precipitation. The volume of maximum precipitation is four inches in three consecutive days and rarely does the rainfall cross this limit. Hence, a 1200 sq.ft. plot gets 400 cubic ft. of water from such heavy precipitation. Of this 100 cubic feet is stored in the pit and 300 cubic ft in the plot. If the soil depth of such a plot is 4 ft., then it holds 1600 ft. of water after full saturation. The method has proven to be a boon in times of sudden drought spells during monsoons. When this happens, a 1200 ft plot with a soil depth of 4 ft. can retain at least 25% to 30% of the 1600 cubic ft. of water as capillary water, while the rest 70% flows down as gravitational water, and as it is blocked by the impervious layer below, it flows towards comparatively lower plots as seepage or sub-surface flow, providing enough moisture regime to sustain crops against a drought of 15 days.

The "five percent" model is a corollary to the Jaladhar model practiced on medium uplands and medium low lands. The model derives its name from measuring 05% of a 20 decimal bunded plot for a three and half feet deep water harvesting tank. The water collected in this tank provides life saving irrigation of two inches during a spell of drought. Moreover the water body recharges the soil moisture regime in the surrounding soil after the monsoon starts. Even after the monsoon stops, the recharging continues till the tank retains water. The tank water is also supplemented by seepage from the water body on the upper land. Thus a second crop with less water requirement can also be cultivated as a post monsoon crop. The model has a simple blue print. After the pit is dug, different leafy begonias trees and shrubs like pigeon pea, sesbania and subabul etc., are planted in the field bunds at the onset of monsoon. Simultaneously fingerlings of 'deshi' air breathing fishes are introduced in the new water bodies. As they grow, the fishes are to be reared in permanent water body from which they can be shifted to the tanks next year. Application of pesticides are restricted. Both the models make for self-sufficiency in water requirement, augment income, provide better nutrition and aid towards sustainable development. They are therefore, proven alternatives for better water management and utilization.

RATIONALE FOR HILLY AREAS - A Casestudy of Koraput

Water harvesting and irrigation in the hill lands of Kashipur - a project by IFAD.

Pix : Ghani Zaman for CPSW.

It is surprising that in a hilly, undulating and sloppy region like Koraput, the government has started so many irrigation projects like Upper Indravati, Upper Kolab, Balimela, Machhkund, Potteru, Baskel and Satiguda some of which are in operation and some are yet to be completed. The elevation and slopes, that is the physiography of the region as well as the soil and ground water recharge capability (see table) make it totally unsuitable for canal irrigation. These projects which are supposed to irrigate and generate power have only resulted in the displacement of numberless tribals, deforestation, submergence of fertile cropland and waterlogging of many areas. The government would have done wisely, if it had just exploited the ground water resource. Even now there is no hint of a shift in policy or priority in fund allocation. Unless such a change in the offing, Koraput district (undivided) will only be further improvised.

Table - 21 : Geohydrological Characterstics of Various Physiographic Divisions of Koraput District

Sl. No.	Physiographic Division	Geomorphic Characterstics	Soils	Rainfall (in mm)	Streams/ watersheds	Hydrological Character/ Groundwater Possibility	River Basin/Main watershed (Stream name)
1.	Koraput Mountainous terrain, General elevation of the land is 800-900 meters above mean sea level.	Residual Hillocks, long table hills, Intermontane valley fills, dissected non-oriented-moundshape hillocks, drainage, gullies.	Lateritie soil - good ground water rocharge	1600-2000	Winter 1.0 to 7.6 Summer 3.8 to 14.6	Perennial streams, Valley springs/ Scope limited.	Machhkund {LB Machhkund KB Machhkund, U.Machhkund Jhanjabati (1,2)}
2.	Nowrangpur-Jeypore Plateau, General elevation of lands is 600 m A.M.S.L.	Residual Hillocks, resistent denudational Hillocks, flat topped lateritic surface, partially lateritized rocks.	Red soils & Alluvial soils	1600-2000	Winter 1.7 to 6.5 Summer 3.3 to 11.5	Perennial Streams/ Moderate scope in limited areas.	Upp.Kolab {Garid, Kolab, Guradia Kolab Kerandi} Upp.Indravati {Bhaskel, Amrrali, P.B.Indravati, Jaura, Muran, U.I.Golad}
3.	Malkangiri undulating plain, General ground elevation is 60-200m A.M.S.L. sloping in SE direction	Less disscted/resistant linear and non-oriented low lying hill ranges, resistant low lying isolated hillocks.	Black soils in low lying patches and red soils.	1600	Winter 1.5 - 9.5 Summer 3.5 to 12.8	Semi-Perennial to ephemeral streams, high runoff/ Moderate scope.	Subari-Sileru {Main Sileru, Gurupriya, Patal.
4.	Nagavali-Vansadhara river valleys land elevation 150-300 mt A.M.S.L.	Structural hills, denudational partially latertised rocks flood plains, levee, alluvial plain.	Red soils, Black soils, and Alluvial soils.	1200	Winter 1.2 - 3.7 Summer 3.0 to 6.2	Semi-Perennial to ephemeral streams medium run off/ Promising in alluvial plains moderate scope in others.	Vansadhara & Nagavali {Nagavali (1,2) Mahendrapatana, Badjher, Ganjuda, Peda, haribanja, Poladi, U.Vansadhara}



Pix : Ghani Zaman for CPSW.

Water harvesting and irrigation in the hill lands of Kashipur - a project by IFAD.

RAIN WATER HARVESTING & RURAL DEVELOPMENT - ANOTHER MODEL

Ten kilometers away from Chowdwar, a small township near Cuttack, ten tribal villages underwent a transformation. The Centre for Youth and Social Development (CYSD) a NGO facilitated this process and provided the necessary inputs. The project aimed at stabilizing ground water by constructing small rain water harvesting structures. Taking into account the interdependence of soil, water and forest, the project developed the catchment, encouraged plantations and stored rainwater, making the maximum utilization of all its resources through its recycling. With this blueprint, tribals were motivated to dig wells in the command area, cultivate cash crops round the year, undertake duckery and pisciculture. During the last four and half year six integrated water harvesting units with a total command area of 465 acres were commissioned and 48 wells with a total irrigable area of 160 acres were laid. 52 tribal farmers are earning much more than before through the opportunity of additional cropping in the winter and summer seasons. The landless on the other hand entered into Duckery and Pisciculture with the help of the Central Institute of Freshwater Aquaculture (CIFA). Meanwhile, soil erosion was successfully prevented by a 25 acres bamboo plantation in the catchment of Kochila Nuagaon and Kandugalia villages. In all, the project has proved to be a feasible alternative.


Pix : Manoj K.Pradhan.

Another Project constituted by Block Officials harvesting stream water and irrigating in Raikia block of Phulbani district.

The work in these villages started in early 1988 with Non-formal Education and Mother & Child Health Programmes as well as trust building with the people. Even, earlier to this, there was some contact with the people through one of the youth who was living in these villages. However, the project concept was taken to the people in the beginning of 1989. When dialogue started with the villagers, major problems encountered were Land Tenure, Land settlement, Grazing, indebtedness, unemployment, strong group dynamics and conflicts in the villages, poor agricultural yield, lack of other kinds of crafts or trades and marketing opportunities.

The project initiated activities to form interest groups and village level organisations as well as women sanghas in each village. 2 villages, one in each cluster was selected to demonstrate models and more intensive efforts were made in these two villages from the beginning. Rain water Harvesting Technology was not very easy to explain the people. The main problem was "Land Tenure" which has a great relation to water sharing and increase in agricultural productivity.

Land Tenure : In cluster -I and II most of the low land which situated below the W.H.S.s belonged to absentee land lords and big farmers. In cluster -II, people were cultivating either forest land or Govt. waste land and in many other cases, the legal entitlement and actual possession was very different. Hence, any investment on those lands was not acceptable to banks. In the first case, rounds of negotiations took place between land owners and share croppers for investment on W.H.S and wells, sharing of harvests and long-term security of share croppers. But all options offered to the land owners did not result in any solution. Land owners, doing good jobs or business in Cuttack city had really no interest to increase crop yields. So, it was very disappointing. In the case of the second cluster, the local Tehsildar and revenue officials were persued to organise a camp for land settlement (basically for mutual exchange of legal pattas and demarcation of patta lands, not taken possession). There was some response, the problems could not be resolved.


Pix : Manoj K.Pradhan.

Rain water harvesting and Ground water recharge can provide sufficient water for double and triple crops.

In still another case, the land below a proposed W.H.S belonged to the villagers of another village situated 15 kms. away and not cultivating. There an effort to sell away all those land to the people who were actually cultivating and in turn, promote Diary and Goatery schemes for the villagers who got the legal possessions. If the land was going to be sold to an outsider, then there was no reason left to construct the W.H.S. But, this idea was also dropped due to some complications.

Finally, the project had to start with weak points. Then, release of mortgaged lands resulted in further conflicts. In a case an outsider who purchased 25 acres of tribal land for "Rubber Cultivation" went around with a Gun and motivated the villagers not to join the project activities. He promised people health and educational facilities. In another incident, a kind of class conflict took place between the tribals and general caste people. The tribals, basically land less, were doing wage work on low rates and selling their lands as well as had very underdeveloped agriculture. When, the general caste people could not do all these exploitation, and tribal people (located in upper side) wanted to use the water resources, the general caste people wanted to create conflicts. Project staff were beaten up without any reason and the cluster office was looked by these people. One patch of land used by tribals as passage to take their livestock to the forests was blocked by the general caste people from nearby villages. One day, the general caste people went with weapons and the tribals came with their arrows. In the war, some people were seriously injured and the police intervened. Finally, a peace committee was formed and some compromise was arrived at. But, the main issues could not be resolved.

Grazing : Rabi season came, few villagers wanted to cultivate second crop. But were not able to stop the grazing of animals comming from nearby powerful village. After a lot of discussion when one village cultivated second crop on a collective basis in which the landless also participated, was destroyed by animals. The people who came to talk to the herders faced a conflict which became serious. The project tried its best and leaders of various villages were invited to consider the matter. With some punishment, the matter was resolved. But other village found it hard to do.

W.H.S. & Interest Groups : Water user groups were formed on these villages. Agreements were made with them. Then, the work started. But after sometime, it was realised that, only women and children are working and the men went to work outside. This indicated that the landlessness of the people do not create much interest in them. When demand came from other villages, it was found that domestic water need was the primary interest, not irrigation. In two sites, the irrigation department was planning to do structures for last 10-years, but the people were denied rights to do any thing. Otherwise, the technical feasibility of such a technology was found good.

Cactchment Treatment & Soil Conservation : Plantation of Bamboo and Forest protection organised to conserve soil and prevent siltation of reservoirs.

Pisciculture : In an experimental basis, this was taken up in the ponds and landless got the benefits.

Crafts & Trades : There was an effort to transfer the technology to the local youths for management of schemes and upgrade the craftman skills. Crafts and trades related to agriculture, forestry was attempted to initiate in the villages. Also, market studies were carried out on a regular basis in the local markets and outside to known the demand of the products. Special emphasis was given on training of few artisans on water lifting devices and irrigation management. There was thrust on local skill upgradation and technology transfer learning from other areas. Development with water use and sustainable management was found to be a long-term process.

The success of these initiatives depend on many factors. Careful facilitation at the grassroot by state officials and NGOs is crucial. Implementation of certain legislative measures and reforms are also equally important. Then, only rural and social development can take place on a sustainable manner.



Pix: Sanjay K. Khatua.

Rain water haversting and Ground water development with Water- shed Approach is the only sustainable way.

CONCLUSION

In order to uplift the standard of living, water development is perhaps the single most important bulwark against eradication of poverty. But such developmental activity should be environmentally sustainable.

India is bestowed with a unique pattern of precipitation, wherein 70-90% of rainfall occurs during 4 monsoon months with very uneven spatial & temporal distribution. Since it is needed in all walks of life, its conservation through storage has become essential. Even, the National Water Policy enacted by Govt. of India in 1987, lays emphasis on this scarce & precious natural resource and suggests that it should be planned, developed and conserved on an integrated and environmentally sound basis.

But unfortunately this is not the case. Completion of the ongoing and new M & M project will cost the state Rs.1350 crores besides social and environmental repercussions. On the other hand Integrated Rural Development will cost the state only Rs.10,000/- a hectare, (3 times higher than the GOI rate of Rs.3500 per hectare) where irrigation costs Rs.50,000 per hectare. Apart from this there is the question of sustainability and suitability to Orissa's agro-climatic and topographical condition. If Orissa has a vast ground water potential which could be utilised in a sustainable manner there is no rhyme nor reason why big dams should be preferred to them.

Another problem area is the policy of priority. Drinking water is accorded top priority in black and white but practical demands of urban and industrial areas far out weigh domestic and livestock requirement in other areas. For example, the requirement for Angul-Talcher belt is 443.0 cusec water per day. This meets the demands of NTPC, FCI, Coal fields and domestic supply all of which is supplied from the Rengali-Samal barrage. Consequently, the villages downstream face water scarcity. Moreover most of these companies do not pay their water charges regularly. Such was the case of NALCO whose accounts were seized this year (1994) by the District Collector for non payment of water tax. Moreover, companies can easily invest money and create their own sources of water while the poor suffer. The point to all this is that setting priorities on paper are useless unless they are implemented on the field.

The annual renewability of water might be a bounty of nature, but even with a renewable resource like water, one has to ensure that it is available where it is needed, in usable form, at the right time and in the required quantity. It seems clear that any policy concerned with the productivity of land, must incorporate measures to ensure that water is adequately protected from pollution and other types of degradation.

Water picks up, from the land, a lot of mud and this makes it unfit for agricultural use, especially since all mud is not soil and thus beneficial to plant life. Similarly, salts present in the soil can dissolve in water, making it unusable. Pollutants like pesticides and other chemicals, which run off the land get into streams and waterways, includes compounds such as nitrates, organic herbicides & pesticides which have their origin in agricultural operations". (Prof. Raul Cardenas. "Water Pollution"). The pesticides, while protecting some crops, are harmful to others. They also get assimilated by vegetables and other agricultural, products, making these products unfit for consumption. Besides this, there are three other sources of pollution in which water is 'damaged', becoming increasingly unsuitable for agricultural use. Industrial waste, human waste and atmospheric pollution are all threats to the purity of water. Growing urbanisation and sewerage disposal in places like Cuttack, Bhubaneswar, Sambalpur Rourkela, Angul etc. is posing a big problem.

Industrial waste, considering its toxic and chemical nature, is an especially grave hazard to agriculture. However, inspite of several laws and control mechanisms, very little progress is made in this, due to the financial and political power of the industrialists. It is, however, now known that certain types of pollutants in the atmosphere, besides negatively affecting rainfall patterns, can be picked up by water, while it is in passage, as rain, through the atmosphere.

India's economic and social structure is based on agriculture. To meet the growing food demands irrigated agriculture is unavoidable, specially its conservation and development in hilly and drought prone areas will be the real challenge ahead.

Desertification is observed in most parts of west and south Orissa.



Pix : Ghani Zaman for CHSW.

DROUGHT

DESERTIFICATION : GLOBAL TRENDS

Desertification threatens 35% of the earth's land surface (45 million Km^2) and 19% of its population, that is, 850 million people. 75% of this area and 60% of its population have already been affected.

Land irretrievably lost through desertification has continued at a rate of 60,000 km^2 annually, as reported by UNCOD (United Nations Conference on Desertification) at Nairobi in 1977. Land reduced to zero or negative economic productivity has increased to 210,000 km^2 a year since 1977. Areas affected by desertification in the drylands stand at 31 million Km^2 in the rangelands (80% of total), 3.35 million Km^2 in rainfed crop and (60% of total), and 400,000 Km^2 in irrigated lands (30% of total). As per the first assessment done by UNCOD for formulating a Plan of Action to Combat Desertification (PACD) at the global level, twenty-seven million hectares of the earth's surface are lost every year and 3,475 million have been already affected by desertification, leaving alone approximately 5,215 million hectares of productive land which needs urgent attention for scientific & sustainable management.

DROUGHT & FAMINE IN ORISSA

Orissa, is a drought ravaged state. As early as 1866 to even as recent as 1994, Floods, Droughts and Famines have consecutively devastated the state, affected lakhs of its inhabitants and served as a severe blow to the resources of this back ward state. Droughts are not an unlikely or strange phenomenon of this state. West and South Orissa are facing frequent drought situation and the whole area is heading towards a process of desertification. Prof. A.B.Mishra contradicts this and says in his Oriya Book "*Marustruti O Marudi*", drought is the result of the desertification process, not vice-versa. The consequences of this is well known. Poverty and social regression are bywords of life in Orissa.

HISTORICAL ACCOUNT

1866 :- The Great Famine of 1866 (Naanka Durvikshya) is perhaps one of the worst famine ever recorded in the history of early Orissa. The failure of monsoons in 1865 and the subsequent loss of crops caused the devasting famine of 1866. The Campbell Commission 1866, thus wrote in its report, "The famine in Orissa stands alone in this, that there was (till a comparatively late period of its history) almost no importation and the people, shut up in a narrow province between pathless jungles and impracticable sea, were in the condition of passengers in a ship without provision. Things came to such a pass that money was spurned as worthless" At the end of this caprice of nature, over 30 lakhs had perished due to the scarcity of food grains.

1920 :- History repeated itself in 1920. The failure of monsoons in 1918, the severe floods of 1919 brought about famine the following year in Puri and other districts of Orissa. Government response was faulty and halting and when agitations reached their gates, the bureaucracy behaved incorrigibly, suppressing starvation deaths and rendering no help to minimise the situation. Consolation only came in the form of the late Pandit Gopabandhu Dash who with the cooperation of eminent persons like Mahatma Gandhi, Sri A.V.Thakkar, Dr.C.F.Audrews, Lalalajpat Rai and others did his best to give succor and nourishment to destitute children and all others.

1954-56 : The drought of 1954-55 was perhaps the most wide spread of droughts in the post-independence period. It affected all the thirteen districts. The drought hit the state with the failure of monsoon (annual rainfall was 32.61,40.2 and 25.7 inches at Balasore, Cuttack and Puri respectively) in 1954 and the indiscriminate selling of food grains without any contingency. The low records of rainfall followed by prolonged spells of dry weather squeezed the juice out of the earth, cracked and baked it, leaving crops high and dry. In all, the drought spelled disaster on 26,20,00 acres of land and 35,82,000 people. Relief work (costing Rs.12 crores) continued for three successive years from 1954-56 as normalcy was not restored.

1966 : A century after the great *Naanka Durvikshya* of 1866, in the year 1965, there was an utter failure of showers in the whole of Orissa and particularly in the seven districts of Kalahandi, Koraput, Bolangir, Dhenkanal, Sundargarh, Sambalpur, and Phulbani. The average rain fall recorded between March and October was only 856 mm while the normal average was always 1,369mm. This scarcity of rainfall destroyed Kharif crops in 18,35,200 acres, and partially damaged 42,67,700. The sum total of loss was to the tune of Rs.80 crores. The districts worst affected were Kalahandi and Bolangir. So great was the impact of the ensuing drought, that many migrated for food and work, while the women and children sold utensils, cattle and other belongings for buying food. Dr. Anup Singhdeo, the then Deputy Minister also reported that driven to utter hopelessness, there was distress sale of children and many starvation deaths (17 in all, as recorded by the Orissa Drought Relief Committee). Though the Government sanctioned a total of two crores and nine lakhs, (including Rs.15 lakhs for gratuitous relief, Rs. 50 lakhs for test relief work, Rs.36 lakhs for supply of drinking water, Rs.25 lakh for fertilizer loan, and Rs.33 lakh as tussari loan), this was not properly utilized nor disbursed, thereby further deteriorating the situation. However, an unofficial relief Organisation called the Orissa Drought Relief committee constituted under the chairmanship of Smt. Rama Devi, did commendable work. It established 91 centres in Kalahandi and Bolangir districts that gave free food to 20,000 people daily. The committee also ensured the care of destitute children and provision of nutritional food to expecting mothers. In all the committee incurred an estimated expenditure of 8,45,000/- that was met from donations.

1979-80 :- After the 1950s and 60s the next severe drought that hit the state was between 1979-80. With very little or no pre-monsoon rain and an erratic late monsoon the state was driven into drought conditions that affected all the 13 districts, including 238 villages in 2414 Gram Panchayats and 254 Blocks besides 28 NAC's and 11 Municipalities. The loss of crops in these areas amounted to 14.000 lakh tonnes of paddy, 5-38 lakh tonnes of other crops and 1.9 lakh bales of jute as well. The value of the loss was estimated at Rs.360.88 crores according to the white paper of the Govt. Unlike the 1966 drought report, prepared by the Orissa Drought Relief committee, neither the government's white paper nor the Memorandum for the collectors conference mentioned human casualties like starvation deaths, distress sale of children, or even migration of men and women, even though this drought was as severe as that of 1966. Relief was supposedly quick and the Orissa government asked for a central assistance of Rs.72.14 crores of which it received Rs.10.30 crores as advance. Apart from food for works programme, Minor irrigation projects, supply of drinking water, the government undertook drought relief measures such as test relief work, gratuitous relief, feeding programme, veterinary measures, health measures, construction of roads forest plantation and subsidy to farmers under the Agriculture Department. All this amounted to Rs.1431.48 lakhs.

1982-83 :- In 1982-83 both cyclone induced floods and following it drought left the state scarred. In May 1982, the state received an annual rainfall of 379.00mm against the normal 70.8mm. Almost all districts recorded either deficient (-20% to 59%) or scanty (-60% t0 -99% of the normal) rainfall in May,'82. As a result cultivation of Kharif crops were delayed. The eager wait for the monsoons was answered sadly with a devastating cyclone that hit Orissa on the 3rd and 4th June, leaving 11,468 livestock and 245 people dead. Vast innundations of coastal tracts of Puri, Cuttack and Balasore districts not only destroyed the seedlings but also gave a severe blow to all agricultural operations. After this there was a dry spell for a month from 16th of June to 15th of July with little or no rain in all districts. The outcome of this was of course an expected drought that resulted in a loss of 19 lakhs tons of paddy and 1 lakh ton of non-paddy crops, whose value was estimated at Rs.200 crores (appsrox.). Relief measures by government were elaborate and detailed as the Memorandum of the Revenue dept. on the drought situation in the state shows the expenditure towards this to be of the order of 5792.74 lakhs.

OFFICIALLY DECLARED DROUGHT PRONE AREAS

With the primary objective of "Drought proofing" and amelioration of harsh conditions imposed on people by recurrent droughts, DPAP was launched in the year 1974-75 in 14 Blocks of Phulbani district and 11 blocks of Kalahandi district in Orissa. Again, this was extended to eight blocks of Bolangir district & six blocks of Sambalpur district in 1982-83. The total geographical area and population covered under this programme as per 1981 census are as follows

Table - 1 : DPAP AREA & POPULATION

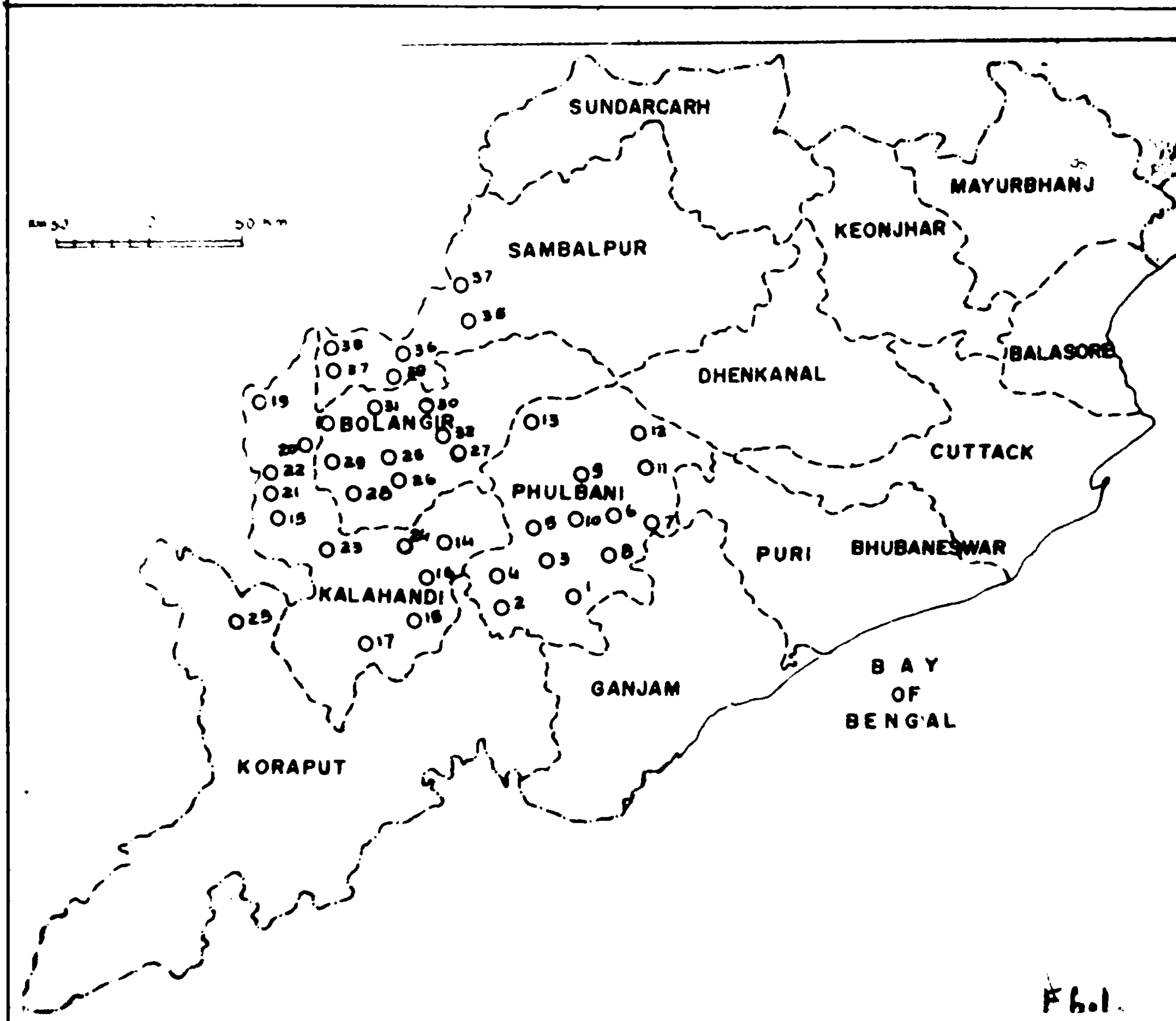
Sl.No	District	Area	Population
1.	Phulbani -	10,026.59 sq.kms.	5,94,000
2.	Kalahandi -	4,825 sq.kms.	7,36,266
3.	Bolangir -	3,467.66 sq.kms.	6.31.032
4.	Sambalpur -	3,173.25 sq.kms.	4,34,634

ACTUAL DROUGHT PRONE AREAS

Land use study reveals that Drought Prone Areas (DPA) occur maximum in wasteland, followed by cultivated uplands and medium lands. On detail scrutiny and considering the availability of irrigation sources, it is found that in order of priority, districts which suffer from drought are : Sundargarh (1/2 of its Geographical area), of Bolangir (2/3rd), Kalahandi (1/3rd), Padmapur Sub-division, Koraput (Umerkote & Malkangiri and a part of Jeypore)

It is difficult to understand the logic in declaring Phulbani as a drought-prone district but not declaring Sundergarh, Koraput and border areas of Ganjam and Puri district which suffer regularly and intensively by drought. The Agriculture and Co-operation Department, Government of Orissa in a memorandum to the national Committee for Appraisal of DPAP, Govt. of India has recommended another 66 blocks for inclusion under the programme in 1989-90. In addition to the 39 blocks covered earlier, an additional 11 blocks of Samblapur, 10 blocks of Bolangir, 6 blocks of Kalahandi, 4 blocks of Ganjam, 13 from Keonjhar & 22 from Koraput district were recommended in that memorandum. However, the reasons for which Sundargarh District was excluded from the recommendation, is not clear. In 1992-93, the declaration made by Govt. of Orissa in its white paper on Drought stated that all the 17 blocks and 170 G.P.s in the district with a population of 15,68,442 were drought affected. The rain fall data of the district also confirms the occurrences of drought on a regular basis. The criteria for including or not including certain areas under DPAP is open to debate.

LOCATION OF DROUGHT PRONE BLOCKS OF ORISSA



Source : Amitabha Sarangi.

People of Nilagiri area in Balasore demanding declaration of their area as drought prone in 1991.



Pix · Rinisha K. Mohanty for Eastern Media.

1987 :- The 80's closed with another drought in 1987. As usual the erratic behaviour of rains held the state to ransom. In June the rainfall was 105.4mm, in July the rainfall was fairly adequate and crops already broadcasted in May now showed signs of recovery. But the next months spelt disaster. The rainfall in August was as low as 185.6mm against the normal of 335.6mm. There was no hope for the farmers. From 40 lakh hectares, 13,6 lakh hectares of paddy crops were damaged, while cultivation in 4.83 hectares could not even begin. The same was the story with non-paddy lands. 4.02 lakh hector was left uncultivated and 2.8 lakh hectares were divested out of a total of 21.7 lakh hectares. 25,000 villages under 152 blocks were affected. As in 1982-83 the government undertook the same kind of relief measures that were to the tune of Rs.155.46 crores. Ironically, the governments' white paper ends with the claim that though the drought was serious, "There is no reason for panic"

1992-1993 :- 1992 was a year of natural calamities. Hailstorm hit the state in April-May 1992, a cyclone in June 1992 and it all ended with heavy rain and floods in July, August and September. The monsoon began sluggishly delaying agricultural operations but no sooner had the Kharif crop stood on its feet it was destroyed by the floods which ravaged the state in July and August. Even though in some pockets, seeds had been broadcasted, the dry spell after mid-September dashed all hopes of cultivators. The dry spell continued till the end of October and damaged all Kharif and Rabi crops. The loss of crops was extensive even in irrigated lands as floods had damaged embankment, canal systems and lift irrigation points. Bolangir, Cuttack, Dhenkanal, Kalahandi, Keonjhar, Koraput, Malkangiri, Mayurbhanj, Rayagada, Sambalpur and Sundargarh, a total of 11 old and new districts were affected. The drought hit as many as 6,097 villages out of 32,248 villages in all the 11 districts. Of these 147 irrigated and 317 Non-irrigated villages were severely (above 75% damage to crops) affected while 5,488 irrigated & 145 non-irrigated villages suffered a loss of 50% to 74%.

The history of Orissa's droughts in summary is a history of mismanagement of a play of politics and corruption that have left the people a helpless and hopeless.

GLIMPSES OF DROUGHT IN INDIA

Both micro and macro indicators signal that drought and desertification can become a major threat to the survival of India's millions if due care is not urgently taken to redirect development on an ecologically stable and sustainable path. "(The 7th plan allocation of relief for floods and drought is Rs.8,000 crores per year.) The following excerpts from newspapers throw light on the drought situation in the country. "Andhra Pradesh is in the grip of a severe drought. The state government has declared 235 out of 320 taluks in 22 districts as drought hit following the failure of rains between August and November last year. The Kharif paddy production fell by some two million tonnes, it is estimated. Subsequent seasonal crops have been completely destroyed. People who already live in perpetual poverty and indebtedness are trekking to towns in search of livelihoods. Irrigation tanks and drinking water sources everywhere have dried up. Fodder is just not available so much so that distress sale of cattle has begun." (Indian Express, New Delhi, May 26, 1985).

"The drought in Madhya Pradesh has affected a population of nearly 1.20 crore, one fourth of them tribals, living in 28 thousand villages spread over 23 districts of State. Area-wise, almost 40 per cent of the total villages in the state are reeling under drought, causing a decline of 20 per cent in Kharif output. The worst affected are the tribal districts of Mandha and Shahdol. As many as 1,983 of the 2,017 villages in Mandla lost more than two-thirds of the crop due to drought. Eleven more villages, in the district had crops between 36 to 40 per cent affecting practically each and every village in that tribal area. In Shahdol also 2,090 out of a total of 2,170 villages are affected by drought." (Indian Express, New Delhi, June 19, 1985). "The summer of 1987 is going to be equally tough for the people of Gujrat. Over 12,000 villages, 90 towns and four of the six major cities of the state are likely to experience acute shortage of drinking water this summer, as monsoon has failed for two consecutive years. There is also a possibility of water riots breaking out in many parts, particularly in the arid Saurashtra and Kutch regions, if the stray fights over water reported from rural areas of the region are any indication. The Gujurat Govt. has prepared a master plan to meet the drought situation with an expenditure of Rs.429.86 crores. Out of this, over Rs.94 crore have been earmarked for emergency water supply schemes. The Government had spent Rs.292 crore on drought relief measures in 1985-86 which included Rs.86 crore for supplying drinking water to over 8,000 village and 60 big and small towns. The water shortage is more acute this year and is likely to become grave during the next few months. Many development projects in the state would have to be stalled or slowed down, as funds will be diverted to meet the scarcity condition". (Indian Express, New Delhi, January 1, 1987)."

DROUGHT SYNDROME

Drought causes loss of crop amounting to lakhs of rupees. Such a phenomenon of contingent nature is sought to be solved by relief measures, employment opportunities, feeding programmes, Health care, etc. This is the story of the white paper. But beyond it (as we have already seen) are the sordid details of untold human misery and suffering that would, if it were enumerated, turn the white paper, black. The predicament of a man pitted against a drought is often missed in the white papers of the bureaucracy and the values of the politicians. The sale of one's own offsprings, starvation leading to death or abandoning ones own hearth and home are neither defining nor peculiar features of any normal societies. Yet they are common in seasons of drought. Thus a wholistic understanding of drought would involve these human casualties.

Distress Sale : In a poverty ridden state like Orissa pawning of items like Jewelry etc., occur when a poor family is faced with a contingent need that is beyond his normal means. In such cases the hope remains of getting back these things, which of course does not happen in most of the cases. But when droughts occur and all resources are exhausted farmers not only sell their essential assets, which include household items but also all their landed property and even their very life. This action is forced upon them by circumstances from which there is no deliverance. This is the lot of poor and marginal farmers in the drought hit districts of Phulbani, Koraput, Sambalpur and especially Bolangir and Kalahandi.

Distress Sale of Land : A survey of distress sales over two decades from 1968 to 1985, (representing 2 decades of intermittent droughts) of Amalapalli village in Kalahandi by the scholars of Economics Dept. Sambalpur University is a case in point. In this village a farmer shown to have around 15 acres of land in government records actually cultivated only 1 acre of land in 1985-86, which yielded 2 bags of paddy. The rest was either mortgaged, leased out or sold. This state of affairs started with the farmer mortgaging 2 acres of land for Rs.800/- to a 'Y' of a nearby village. After three years the principal borrowed, compounded to Rs.2700/- with interest. As the farmer could not repay this, the land whose market price was Rs.20,000 was acceded to the other. Again 'X' borrowed three "putis" of paddy and Rs.500/- from 'Y'. He could not repay it even after four years when the amount had increased to Rs.2500/-. The result, he sells 1.5 acres of land. The story does not end there. Again, the same 'X' in 1982 mortgages a land of 2.5 acres for Rs.5000/- to yet another person Z,. A year later he borrows another Rs.5000/-from Z, while signing a paper stating that he had borrowed Rs.7500/-, Rs.2500/ - being the interest for one year. Later that year X once again takes a loan of Rs.3,500/- from Z. With such a huge loan amount, a sale deed is inevitable. In April '85 this was made. Soon another deed to the effect that X would repay the loan in 5 years or relinquish his right completely within 10 years, was signed in presence of three witnesses. If this be the case of a farmer with 15 acres it can be well imagined what would happen to small and marginal farmers who own just one to 3 acres of land. They would be reduced to landless labourers in a single drought year and that of course is a fact of life in the villages of the severe drought affected districts of Bolangir and Kalahandi, Sambalpur, Koraput and Phulbani. Amalapalli itself has witnessed 175 such land transactions involving 160.44 acres of the 500 acres which were transferred to residents of other villagers while the rest was retained by farmers of the same village.

Distress Sale of Labour : Labour comes cheap when there is less demand for it. And for those who eke out a hand to mouth existence, they take what comes their way or starve. They often take advance wages mostly in kind for promised future work. During festivals like the "Nuakhai" (a common festival in western Orissa) one observes a steep rise in such advances. Festival or not, in a drought, with mouths to feed, advances are a must and the proportion of wages invariably decreases with successive advances. The 1985-86 survey of Sambalpur University reports 34 cases for 98 days of work in future in Amalapalli, 28 cases involving 76 days of work in Aunganda, and 19 cases involving 39 days in Dudhipadar. The advance in these cases varied from 3 kgs of paddy for 9 days work, Rs. 80 for 20 days work, Rs.4 for a days work, and 1 kg. of paddy for 3 days work. Another system of advance payment was also common "Halua's" took advances varying from 9 to 14 putis and cloth worth Rs.50 or Rs.25/-. (one puti = 50 kg. of paddy approximately). Exploitation of distress labour is not limited thus to moneylenders, or Gountias of villages, it also occurs in government relief works where contractors reduce the wages from the scheduled Rs.10/- to Rs.6/- and increase the hours of work from the maximum of 8 hrs to 11 or even 12 hrs a day. With no other work available, and too feeble to protest the farmers and labourers have no option.

Distress Sale of Produce : When in normal times middle-men dictate terms to farmers buying rice much below the government rate (Which again gives no profit against cost of production), in times of drought their plight is even worse off. The poor farmer who does not have any place for stocking food grains or means for transporting it to the town has to sell them at a very low rate in the regular market. The case studies by Sambalpur University scholars record sales of 63 bags of paddy at rates of Rs.50 to Rs.100 per bag in Ambaguda and 900 bags of paddy at the rate of Rs.95 to 100/- per bag at Budhipadar in Kalahandi district. Another kind of distress sale of produce observed is that of repayment of loans of cash or kind. Here the returns for a bag of paddy are adjusted against the advance. This leaves the seller with just a pittance. Sometimes, when calculated with the interest, the principal loan advanced increases to a hefty sum and therefore the repayment of produce yield no returns at all.

Slavery : In Independent India, there exists a less characteristic form of slavery-Bonded labour. When a man or woman mortgages his labour for loans in cash or kind and is never able to repay it while increasing poverty drives him to further loans the result is bonded labour. Of course the Indian government recognises this. In point No.6 of the 20 point programme 1986, it declares, "We shall (A) fully implement laws abolishing bonded labour and (B) involve voluntary agencies in the programme for rehabilitation of bonded labour". Thus by July 1988, the number of bonded labourers in the country stood at 2 lakhs with Karnataka having the largest number (62,689) followed by Orissa (45,777) and Tamil Nadu (33,180). Yet, there has been criticism that the identification of bonded labour falls short of the actual number.

The government is not serious in abolishing bonded labour, employers of bonded labour are seldom prosecuted under the Bonded labour system (Abolition) Act of 1976, neither are vigilance committees at district and sub-divisional levels constituted. Rehabilitation of bonded labour under anti-poverty programmes and giving them rights over the local resources i.e. land, forests, water in an integrated and comprehensive way may help them to get out of this vicious circle.

Unemployment & Migration : Migration occurs where there is scarcity of employment and no other means of assuaging hunger. Thus apart from the seasonal exodus of a few who move out of their villages every where the mass abandonment of hearth and home by able-bodied men and even families for making a livelihood is another manifestation of drought. For the farmers whose only work is cultivation and whose only food is the produce of the field a drought could mean the extinction of both. And where there is little or no relief employment by government he is reduced to a migrant. Thus in chronic drought prone areas of Kalahandi and Bolangir, migration is the order of the day.

As early as 1966, the Orissa Drought Relief Committee (ODRC) noted the discrepancy between the government relief measures and the situation of the people. In his statement on the drought in 10 December 1965 the then Chief Minister had observed that for the 60 lakhs affected people a provision of 2 crore and nine lakhs had been made for relief. To this the ODRC reports, "It would thus be found that overall provision of relief worked out at Rs.3 per head of the affected people. It was, later on found that even this little money could not be properly utilized in time as a result of which the situation further deteriorated and there was widespread desertion of villages by the people.

WAGE STRUGGLE

During the early 80's a labourer used to get only 2-3 rupees as daily wage. After pressure from the people on government, it was raised to 4-5 rupees per day in West Orissa. Also, the wage rate in Kendu leaf bush cutting increased. The wage struggle was initiated by people's organisations (called Sanghas) in west Orissa to ensure minimum wage benefit to the landless sector and also, to demand equal wage for women. This received a very good response from the locality, though it created strong enemies among land owning sections who have their nexus with the local administration.

In 1984, Banabasi Sangha of Komna organised the leaf pluckers from 8-10 villages who stopped work and demonstrated in front of the forest Ranger office protesting low payment of wage. An enquiry was conducted by the Labour Officer and a case was filed against the forest department. The village committees of Makanta, Chata, Junjal, Malpara, Toria, Kalimati filed a petition against the forest department in the labour court demanding due wage for kenduleaf plucking. Similar was the experience in case of Khariar, Sinapalli, Boden and nearby blocks.

Minimum wage payment is enforced only in JRY works only where the village committees are active. Forest Department is giving Rs.25/- for Bush cutting in 2-shifts a day. But wages paid to Haluas is very nominal, that is around Rs.3,000 per annum. In Agriculture, Kissan Pays Rs.12/- to men & Rs.10/- to women. Low and unequal payment in "Kissani Wage" is not questioned, but accepted as a reality. In Koknara village of Paikmal, the labourers in 1992 stopped working, bargained & got Rs.15/- as Kissani wage. This was not the case in other villages. [illegible]en, in other villages labourers are getting only Rs.8 - 10. Neither the political parties nor the administration are able to do justice to these people.

BREAKING OF THE CHAINS : THE GOTI MOVEMENT

Bonded labourers (Gotis) have not borne their slavery with silence. Decades of inhuman oppression have seen protests culminating in a movement for liberty and rehabilitation in the 1980s. With mounting public pressure and the cooperation and goodwill of many social organisations, the gotis have been able to achieve some improvement of their lot.

They organised a padayatra of 600 gotis from 4 blocks of Kalahandi district and one block of Bolangir district. A group walked from Boden to Bhawanipatna via Sinapalli and Dharmagada while another group headed towards Bhawanipatna from Komna via Khariar and Karlapata. There they presented a memorandum to the District Collector and after this 35 of them proceeded to Bhubaneswar by bicycle to submit a copy to the Chief Minister. The movement had begun.

The Banabasi Sangha, Komna, soon presented a list of 219 people, identified as bonded labourers, to the BDO, Komna for taking steps to rehabilitate them.

By 1983-84, 300 people of different villages were identified as bonded labourers by the Tehsildar but only 40-50 of them were rehabilitated. This provoked a demonstration by the Banabasi Sangha in front of the BDO's office, Khariar in September 1985. The response was encouraging. With the help of the police, the SDO, Nuapada took up the rehabilitation of the released labourers. Similarly in Khariar block of the 366 identified, 200 were rehabilitated with the cooperation of the BDO, SDO, Sub-Collector and the JSS. 109 of them even got their dues after the intervention of the labour officer, Khariar.

The Goti movement met with some success. Yet there was some justifiable discontent. Non-gotis in some places siphoned off the benefits meant for gotis.



Pix : Eastern Media.

Migration through Kantabanjhi Rly.Station.

Many gotis were also not recognised by government official as such. The situation was proverbially like providing fish and not teaching how to fish. Traditionally being engaged in tilling, gotis who received goats as a rehabilitation measure were found inexperienced in tending them. One of the gotis interviewed revealed that all his goats had died of diseases. This lack of follow-up by both the government agencies as well as social organisations once again reduced some gotis to their former state. That apart, the attitude of other people towards liberated gotis did not change. Rehabilitation without integration into society has been another loophole. Nevertheless the overall situation has been encouraging.

Peasant Uprising : West Orissa is presently witnessing an uprising of peasants who are unitedly demanding fair purchase prices at the time of procurement to avoid distress sale. The Paschima Orissa Krusigibee Sangha and other political forums are spearheading this movement. It is apprehended that unless justice is rendered to them on time the state may face serious political unrest.

Only signs of ancestral property and birth place. A scene from Bongamunda area, Bolangir



Pix : Sanjay K. Khatua

The able-bodied men left for distant places in quest of food and labour leaving their helpless families as destitutes" (ODRC report, 1960). The situation has not improved since then. The minimum wages fixed are never given by the officials/contractors who manipulate the funds. Even after the wage structure was revised from the highest of Rs.8/- in 1976 to Rs.11/- and then to Rs.25/- in 1990, there is no relief from corruption. Instead regularisation of wages and suspension of N.M.R.s from working in Irrigation projects has led to despair among the hopeless. That funds are not enough to provide employment or relief to the drought affected was admitted by the Chief Minister in 1992. The white paper of 1992-93 deplores that central assistance is not forth coming stating that "Whether we have asked for assistance the government of India has given standard reply that the calamity is not so serious to require handling at the national level".

Such circumstances of lack of food, lack of work and lack of alternative sources of income drive villagers from Kalahandi, Bolangir, Sambalpur and Koraput. Migration is charactersied by middlemen (i.e. agents) who offer Rs.1000 to 2000/- and arrange their transport mostly in trucks to places like Calcutta, Raipur, Hyderabad, Vishakapatnam etc. Most often the women, children and the aged and Infirm people suffer as they are left behind. The government while admitting such migration calls it a habit. The Chief Secretary of Orissa told newsmen that migration pattern in Nauapada sub-division of Kalahandi was a "normal feature" and that most of the migrants were not landless but farmers owning 2.5 acres of land. He added that these migrants habitually left their villages at a particular time to earn more wages (Indian Express 13.6.1992). The Governments' claim is only half true. On the other hand studies of the Juba Mahasangha, Bongomunda and the **Council of Professional Social Workers** on migrants to Raipur conclusively establish the fact of drought induced migration. The Mahasangha on surveying the drought conditions of Bongomunda block after a padayatra of 85 villages from 21st to 31st October 91 reported that excepting a few rich farmers and some government servants almost all the other inhabitants are without employment because of the drought which has severely hit agricultural operations. Small and marginal farmers after mortgaging their lands have become daily wage labourers. Even then, there is not enough employment opportunities with sufficient earnings, around. The report adds that even work available fetched a wage of Rs.8 to 11/- for men while women got Rs.2/- less.

Government work is like a drop in the ocean providing every family only 4 to 5 days of work in a year. Moreover, these government works are not situated in every village. They exist only in some of the more influential villages of the panchayat. The report discovers that 2368 persons from 20 villages have migrated. Out of this 733 left for Bargarh, Sambalpur and Rourkela in Orissa while the rest 1585 left for other states, to places like Raigarh (M.P), Bhilai, Durgapur, Kumari (U.P), Derhadun, Delhi, Nagpur, Waltair, Hyderabad etc. The Mahasangha concludes by affirming that though these people have been lured away by the temptation of higher wages they have faced great sorrow, misery and shame there.

THE BENEFICIARIES OF DROUGHT

Kalahandi is not only of the poor, it is also a rich Kalahandi, Kalahandi of the rich, Kalahandi of the Gountias, of sahukars, of zamindars, of contractors, labour agents, politicians and government officials. Not long ago Kalahandi was the repository of diamonds, gems and other precious stones. It boasted of the best Teakwood and Salwood in India, of Yuvaraj rice from Sinapali, mangoes from Madanpur, Rampur and Junagarh. Oranges from Lanjigarh and Guava's of 800gm to 1 kg each from Kapasi and Sharadhapur. The Jaggery of Taranga or the natural Sandalwood forests of Thumal-Rampur, were famous. These products made their way to the markets of Raipur, Nagpur and even as far as Bombay. Traders who came from Rajasthan, Gujurat, Punjab, Andhra Pradesh, Maharashtra etc. were tempted enough to stay and live off this land of plenty. Kalahandi's rich still exist. Yet the drought prone Kalahandi is still the granary of Orissa ! Unbelievable but true. The landless labourer and the marginal farmer toils in the lands of the rich farmers, sees the paddy stalk grow, feels with his hand as he reaps a rich harvest but sadly returns home to a porridge of Ragi. The crops of his desire and love are not under his clutches today. Hence, the drought makes the rich richer and powerful.

GENDER WOES

After male migration women try to sell the last produce at a distressed rate for survival.



Pix : Sanjay K. Khatua.

As drought induces migration, it also consecrates women and the girl child as exclusive offerings to be sanctified at the altar of suffering. When men migrate, most often alone, they leave the aged, infirm, children, livestock and the rest of their property in the care of their wives, who infact become the de-facto head. The headship brings a lot of suffering often barrassment by her debtors even to the extent of sexual abuse. The women has to provide for her household with (1) the advance that the sardars have given before migration. (2) loans from money lenders or (3) through the trickle that comes in at long intervals from her migrant husband. Above all she herself has to earn by the sweat of her brow, working either as an agricultural labourer or as labourer in government employment generation schemes. Here she not only receives lesser wages than men but is also under the constant watch of the male gaze, subject to volleys of abuse, harassment, and in some cases even raped. And for women who do not have any assets to mortgage, the only resource is this kind of slavish work for 8-10 hrs a day for a remittance of Rs.8 to 9. That is not all, she cannot abdicate her duties as a housewife. So on she goes, fetching fuel wood, fodder, cooking, cleaning and nursing her children as well as the aged, all these adds to her misery and workload. The girl child takes a battering from drought along with her mother. Her mother provides her a role-model, of course of suffering. In helping her mother she nurses the siblings, fetches fuel wood, water and does all other household chores.



Pix : Sanjay K. Khatua.

A woman is collecting leaves to eat in Kalahandi.

A study by VIKALP of seven villages in Bongomunda Block Bolangir district Orissa depicts such gender woes. It records that while women get a paltry sum of Rs.8/- for agricultural labour and Rs.10 to Rs.15/- for Earthwork under the Jawahar Rojgar Yojana; 330 families are involved in saving their livelihood by felling fuelwood in nearby urban centres. Of the 412 involved in cutting and felling of fuel wood, 46% are women of the age group of 20 and above while 17% are between the age of 14-20. Thus women constitute about 63% of the headloaders.

As for the girl child, the study of VIKALP in these villages reveal some shocking facts (1) 93.6% of girls between 6-11 years of age are either dropouts or have never attended any school. (ii) Among them 17.32%, 63.17% and 19.5% dropped out from standards I,II,III, and IV respectively. (iii) 43.76%, 13.174% and 42.49% of the girls had brothers attending school, brothers below the school age and either not attending or having dropped out of school, respectively. The survey also (on the basis of a sample study of 20 children of the age group of 6-14 from each village), revealed that during the peak agricultural season (July), the girl child on an average works for 7 hours a day.

The most vulnerable group during droughts are the old, the infirm, women and children. Protein energy malnutrition, vitamin A deficiency and anemia among women and children becomes severe. Moreover, women who share out the food among the family and generally eat less than the others consume a pittance during droughts. Expectant mothers are greater casualties. The age and infirm deprived of special care languish in health. All these groups when subject to one or two days of starvation, lose their body immunity quickly and are more prone to disease and death than others.

MAL NUTRITION & EPIDEMICS

The impact of drought on food and nutrition is dramatic and far-reaching sometimes leading to starvation and death. A balanced diet is the preserve only of developed countries while in developing countries like India and especially in rural areas of most

backward state like Orissa even a single meal in normal times is a dream. Among others the marginal farmers, landless labourers and mostly scheduled castes, scheduled Tribes and women bear the brunt of malnutrition.

In 1988, a technical survey of drought condition in 8 villages of Bolangir district, the OXFAM noted severe malnutrition, as high as 70%, in some villages. The staple diet of these groups of people is rice, ragi, wheat, maize, millets, etc. The tribals used to depend upon forest products like fruits, roots tubers, flowers and leaves but with deforestation the availability of these have decreased to a great extent. Most of the marginal farmers who have an average of 2 to 3 acres of land produce an amount of food that lasts them only 4 months. Even all of this is not kept for their own consumption. It is either used to buy other essential non-food items or to pay back loans incurred in the past year. A single meal becomes the order of the day and sometimes it also changes to meals every alternate days. Earlier because of forests, people were able to somehow survive on boiled tendu leaves, mango starch, powdered, tamarind, tangan and bamboo seeds, Mohula flowers etc. Indiscriminate tree felling increases the food scarcity situation.

Severe malnutrition reduces the immunity of the body and this combined with an intake of unsafe drinking water breaks out in epidemics of gastro-enterities, worms, eyesore, Malaria, meningitis, blood dysentery and diarrhoea. Now as periods of starvations increase and body resistance weakens, man is prey to all the above kinds of illness and infections leading to death.

CHRONICLERS OF STARVATION DEATHS

While the government has been absolutely denying deaths by starvation, the media reports scores of such deaths whose final indictment came in the form of a High Court Judgment confirming starvation deaths and ordering the state government to pay an ex-gratia compensation of Rs.25,000/- to kith and kin of victims. Here are some excerpts from the Chroniclers of death.

"Janata MLA from Kalahandi, Bhakta Charan Das alleged at least 35 starvation deaths in Kalahandi from May to July 85 and added if deaths due to Malnutrition were taken into account the total would reach at least Hundred". - 2nd July 85 INDIAN EXPRESS.

By the end of March '87 nearly 300 people mostly tribals, had died in Kalahandi and Koraput districts. In the Supreme Court, the Orissa Government fought a private petitioner's allegation that the Kalahandi deaths had been caused by starvation. While the administration strongly denies the allegation of starvation death, one has only to scratch the surface to sift the truth from the political mirage. - STATESMAN 17 APRIL 87

In April '87 a three member fact-finding committee of Janata legislative party reported 300 starvation deaths in Koraput district and 334 starvation deaths in Kalahandi district from January to April 87. In May 87 a CPI(M) team led by Biman Basu visiting Kalahandi and Koraput reported that in one year 1500 had died of starvation in Kalahandi district alone. - TIMES OF INDIA 9 MAY 87.

At least seven persons have died of starvation in three village of the worst hit Komna block of drought affected Kalahandi district. Mr. Ravi Das, secretary, Sarvodays Relief Committee (SARCO) while supervising relief work told that three persons in Darlipada and two each in Belardana and Sialati villages had died of starvation. - INDIAN EXPRESS 10 DECEMBER 88.

The one-man judicial commission instituted by the Orissa High Court to inquire into the miseries of the people in drought hit Kalahandi district has confirmed a number of deaths due to starvation and exploitation of the tribals by village Zamidars. The commission conformed at least five starvation deaths in Kalahandi district. However, it could not find any starvation death in Bolangir district. The commission also noted that despite relief measures and development activities to provide employment which were not effective", the rural economy of Kalahandi and Bolangir had been shattered by repeated droughts. - TIMES OF INDIA 10 JULY 1991.

On the 12th of this month the High Court directed the state government to pay a ex-gratia compensation of Rs.25,000 to the families of the fire persons who died of starvation, within two months. - SAMBAD 15 FEBRUARY 92.

"This compensation is negligible and woefully short. It is absurd, Moreover, it is for families of only five victims of starvation. What about others ? Who is fooling whom ? asks SJP leader Bhakta Charan Das... "Nothing has changed in Kalahandi... people still survive on porridge made of mango kernel and poisonous roots" says Kishan Pattanik. The last word was said by Orissa Krushak Sabha Chief, Banka Bihari Das,"This is a mockery of justice-five starvation victim families getting compensation when hundreds have died and are still dying of hunger" THE PIONEER 18 FEB 92.



Pix : Eastern Press Agency

Starvation is an everyday phenomenon in distressed areas.

On March 14,1988 the District Medical Officer, Koraput, reported that, in the district, 78 adults and 33 children had died. 44 of meningitis, 14 of gastrao-enterities, 8 due to chicken pox and 12 of measles (Hindustan times 26.5.88). In his memo number 1266-88. Ref. 849/88, the Tehsildar of Rayagada sub-division of Koraput district listed under "Epidemic death," 34 persons dead of fever, headache, dysentery, vomiting etc. In a Micro-level study of Koptgarh and Tumudibandh blocks of Phulbani considered representative of the whole district, the National Institute of Social Work and Social Sciences (NISWASS) reports hundreds of deaths due to malnutrition. It also states the infant mortality rate to be as high as "318 per thousand live births, the highest in the country" (Indian Express 18.4.88).

THE POLITICAL EVENTS SINCE 1966

Kalahandi was made an issue that instead of bringing succour to the people on a permanent basis, exposed their poverty and humiliated them before the World. The issue of drought and starvation and child sale was used by politicians to checkmate one another while the people killed themselves eating roots and tubers. Way back in 1966, **Indira Gandhi** heard the plight of the drought-hit people in Khariar and came to see for herself. This was the first ever visit of a Prime Minister to the district. Promises were made, hopes raised. But the administration went into a prolonged hibernation till the visit of a new Prime Minister. Meanwhile **Parvati Giri** created ripples in 1985 by breaking the news of child sale in Kalahandi. This sensational report drew hordes of journalists to the district. **The Sunday** in its August 11-17 issue the same year, published the photographs of the woman who, to feed her child sold away her niece. This was followed by more revealing and glaring write-ups. Finally, it was **India Today** which aptly captioned an article 'Kalahandi : the black spot' and described the place as hell ignored by gods. This brought the plight of Kalahandi to the centre of attraction.

Amidst reports of child sale and dehumanising poverty **Rajiv Gandhi** came to Kalahandi in July 1985. He saw for himself the gruesome reality. This was followed by a flurry of activities in political circles and Kalahandi was never to be the same again. New schemes were announced, a special cell in the prime minister's office was created. And the media kept an eye on the issue, which further accentuated the political atmosphere. At last, there was an intellectual acceptance of the problems plaguing Kalahandi. If Rajiv Gandhi made the ice melt, it was **Bhakta Charan Das**, a social activist turned politician, who set the ball rolling. In *1987*, Mr. Das was addressing a meeting at Nandol. He asked the audience : "Are you living like human beings ?" 'No' came the reply in chorus. The message was clear. A son of the soil, Mr. Das trekked village after village mobilising people. His message everywhere read one thing : "Demand for your basic rights, not implore". And it went down well.

On February 10, 1986 the Orissa Assembly witnessed a fierce debate on Kalahandi. The then revenue minister stated in the House that baby sale was customary in Kalahandi, sparking of an acrimonious scene. This was but part of the unfolding drama that followed. Scores of VIPs visited the district in the full glare of media. On Jan. 28, same year, Mr.Chandra Shekhar, then the Janata Party president, during his visit to the district strongly pleaded for a **special development board** under Article 371. Later, this went on to become the main weapon of the opposition to keep the issue on the boil. Four months later, a three member committee set-up by the national executive of the Janata Party, reported that 334 had died of famine and nine directly due to starvation. The team comprised of three national leaders, Mr.Purusottam Kaushik, Mr.Surendra Mohan and Mrs.Mrinal Gore. The report was presented at the national executive meeting at Bangalore. **Paschimbanga Krishak Sabha,** the peasant wing of the West Bengal unit of the CPM, sent a delegation to Kalahandi to assess the drought situation. On May 23, the Bengal CPM even observed **'Kalahandi Day'** to draw the attention of the nation and raise funds for relief work.

Ironically, the most blistering attack came from none other than the Seva Dal Committee, a wing of the Congress-I. The committee, on instructions of Rajiv Gandhi, visited Kalahandi and submitted a report. It blew into pieces all the complacent reports of the Orissa Government. Said the report "If the poor people of Kalahandi have survived it is not because of any meaningful developmental programme, but their own **resistance** in adjusting to relative starvation for a long time". And it continued, "It must not be forgotten that during 1977, when our party was losing to the opposition almost everywhere, it is the poor people of Kalahandi who stood solidly behind the party. Politically also we have a duty and obligation to them."

Many Prime Ministers have visited Kalahandi and Bolangir, but the situation has deteriorated. Late Prime Minister Rajiv Gandhi meeting the people.



Pix : Eastern Media.

The Baidya Nath Mishra Commission in its report confirmed at least five starvation deaths, that too under the nose of the district administration. The commission which inquired into the cases of starvation with the directive of Orissa High Court severely indicted the then government and was explicitly clear that five deaths were directly by starvation.

Later, after four years, when the reports of death and drought surfaced once again *Rajiv Gandhi* visited the district. During his first visit Rajiv had ordered 'Operation Salvage' for immediate relief to the people. However, after two months when asked about the project the collector pleaded ignorance. This time Rajiv ordered ADAPT in the district. But the performance remained dismal. As Indian Express wrote "the objectives of the prime minister's Kalahandi visit might have fulfilled the efforts of the chief minister who have practically succeeded. But it has not soothed the ruffled feelings of the drought stricken people of Kalahandi. During the *V.P.Singh* and later *Chandra Sekhar* Governments, efforts were initiated to bring the poverty pockets of Western Orissa under a special development board. It needed Parliament's approval and as per the provision, the State Government was to recommend the issue to the Centre. As pressure mounted, and there was a positive indication from the present Union Govt., the Orissa government played its cards. The Chief Minister declared that a House Committee would go into the issue which accused the Congress -I Govt. of not doing anything for the people of Kalahandi.

Even today, it is a sorry spectacle to see that life has hardly changed in the villages of Kalahandi. Death stalks in dangerous frequency and droughts are an annual ritual. One Social Activist remarked that Amatipalli village has become a tourist centre where the suffering villagers sit with begging bowls, waiting for some more tourists to come everyday.

CAUSATION OF DROUGHT AND DESERTIFICATION

To understand this issue, one can take the example of the current African crisis. The common thesis proposed by funding agencies and international development agencies is that Africa's crisis is related to its having been "neglected" by the modern developments in agriculture. Many studies, however, are now revealing the fact that it was the introduction of commercial agriculture and hybrid plant varieties that induced ecological imbalance in Africa. Timber Lake's comment's on the cause of Africa's ecological decline is pertinent, "Africa is dying because in its ill-planned, ill-advised attempt to modernize itself it has cut itself to pieces" (Timber Lake 1985). Responding to this crisis of Africa, Rosenfeld of the *Washington Post* in USA has confessed : "It is hard to look at black Africa without feeling that something has gone wrong. It is not just the specter of suffering that troubles us. It is the sense that we who thought we know everything, did not know well enough although we acted as we did" (Timber Lake 1985).

MULTI-FACETED DROUGHTS IN WEST ORISSA

Due to availability of reports, studies and information, Kalahandi is dealt much more, in depth. Yet, some parts of Bolangir are found to be worse affected.

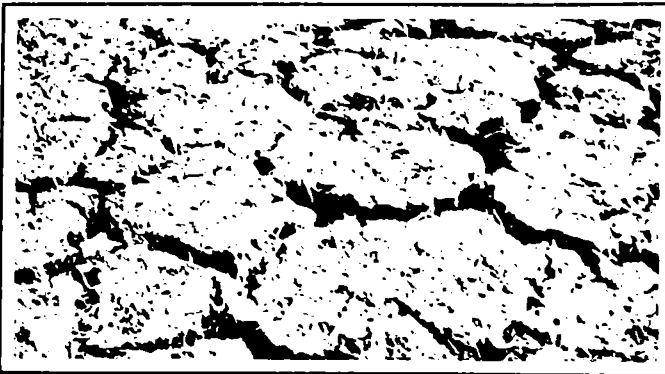
The whole of West Orissa suffers from Meteorological drought. **Meteorological** Drought occurs when the total rainfall received in a particular period is less than 75% of the Normal (National Irrigation Commission, 1992). Officially 25% to 50% departure from normal rainfall is considered "Moderate drought" while a departure greater than 50% is considered "severe droughts". Also, the Irrigation Commission (1992) considers an area to be drought prone when the normal annual rainfall is less than 750 mm which is not sufficient for the sustenance of the crop. Based on this criteria, Kalahandi, Bolangir and Sambalpur districts can not be termed as drought prone. All the districts receive more than 1200 mm rainfall on an average in a year where as the district annual average of Kalahandi is 1342.86 mm. The Indian Meteorological Department (IMD) considers an area drought prone when 20 percent or more of the years receive less than 75 percent of the normal rainfall and probability occurrence exceeds 40 percent of the years. Hence as per this theory the three districts don't come under drought prone category. But an analysis of the distribution of rainfall, Soil-moisture stress and crop loss shows that the region suffers from drought conditions.

RAIN SHADOW WEST ORISSA

The monsoon flow analysis by Sri S. Dash and Dr.K.L.Pujari identified the Monsoon Shadow Zone. They observe that the South West Monsoon in its course of flow, strikes the hill ranges before reaching Maithili, Dharmagarh and Padmapur. The modified draft of the monsoon keeps the following places in the rain shadow area :

Group "A"	Group "B"	Group "C"
Nuapada		
Maithili	Dharmagarh	Padmapur
Boipariguda	Junagarh	Sub-division
Jeypore	Kokshana, Narla etc.	
Bolangir, Baragarh		

Prior to construction of Hirakud Dam, the average annual rainfall of Sambalpur and Bolangir District was 1526 mm & 1463 mm respectively as against 1748 mm of Mayurbhanj and 1482 mm. of the State as a whole. After its construction, Padmapur Sub-division of Sambalpur district and Titlagarh Sub-division of Bolangir district are experiencing drought or excessive rainfall while the intensity of drought in Nuapada has increased. Such climatic aberrations are partly due to global factors, partly due to deforestation and also due to the Hirakud Dam, the huge 737 sq.kms reservoir and water holding command area, says Dr.B.N.Sahoo. (The monsoon flow direction and precipitation behaviour has been discussed in Atmosphere Chapter). Low rainfall is one major character of the area and its erratic nature makes it worse.



Pix : CPSW's Documentation Centre.

Drought.



Erratic Rainfall, but good ground water potential.

Pix : Sanjay K Khatua

Based on the normal practice followed by the IMD that if the annual or seasonal co-efficient of variation of rainfall is 30 per-cent or more or the monthly co-efficient of variation of rainfall is 50 per cent or more, the rainfall is said to be of erratic nature & the sub-divisions classified to be drought prone. Based on that consideration, the three sub-divisions of Kalabandi district are found to be drought prone by the Central Water Commission. During the 79 years of rainfall pattern study from 1902 to 1980, the CV of monthly rainfall in Bhawanipatna sub-division is more than 50% except in July and August, in all the months the rainfall is classified as erratic in nature. In case of Dharmagarh sub-division the monthly rainfall studied for 17years from 1964 to 1980 shows the same trend. But in case of Nuapada, the rainfall studied for 63-years from 1918 to 1980 shows erratic nature of rain fall in all the months, except in July. Based on this analysis, the whole district is found to be drought prone (Table - 4)

Table - 4 : Analysis of Rainfall Variabilities

Sl. No	Name of the Sub-div.	Annual	Seasonal S-W Monsoon	Monthly	Drought Non-Drought
1.	Bhawanipatna	21.89	24.05	40.61-366.34	Drought
2.	Dharmagarh	20.90	25.26	35.50-327.74	Drought
3.	Nuapada	26.91	27.63	43.25-452.91	Drought
4.	Kalahandi	20.96	22.10	40.02-379.83	Drought

Table 4 proves that drought occurred in all the 4 months of the Monsoon season in Kalahandi district.

Table - 3 : Rainfall of Kalahandi District

Name of the Sub-division/ District	N.A.R. (in mm)	75% of N.A.R (in mm)	No of years data considered	Years having less than NAR No.	%	Years having less than 75% of NAR No	%	Drought/ Non Drought
1. Bhawanipatna	1380.89	1035.67	79	26	32.91	9	11.39	Non-Drought
2. Dharmagarh	1208.39	906.29	17	8	47.05	2	11.76	Non-Drought
3. Nuapada	1227.01	920.26	63	24	38.09	6	9.52	Non-Drought
4. Kalahandi	1342.86	1007.15	63	31	49.20	7	11.11	Non-Drought

NAR : Normal Annual Rainfall.

Rainfall analysis of the 3 sub-divisions of old Kalahandi district is presented in Table-3. Though there is a deviation in NAR in almost 32 to 49 per cent of years, the deviation which causes drought is not observed. Another factor which is important to note is that Nuapada and to some extent Dharmagarh sub-divisions receive less rainfall due to rain shadow effect and it has become highly erratic because of deforestation

ERRATIC NATURE OF THE RAINFALL

The National Commission on Agriculture (1976) also defines drought as that which occurs when the rainfall in a week is half of the normal or less or when the normal weekly rainfall is 5mm or more. If there are 4 such consecutive weeks in a rainy season or 6 such consecutive weeks in other seasons, the area may be classified as drought affected. The irrigation Commission (1992) on the other hand says; "if the frequency of such erratic distribution of rainfall occurs, more than 20 per cent of the years under consideration, the area could be declared as drought prone. The dry spell duration study based on weekly rainfall (1971-80) of Bhawanipatna sub-division does not confirm in case of South West Monsoon, but is experienced in 2-years in case of North East Monsoon. On the other hand, the dry spell duration study based on weekly rainfall (1971-80) of both Nuapada and Dharmagarh sub-division, monsoon in 1 and 2 years respectively and in North-East Monsoon in 2 and 3 years respectively. Dry spell in case of North East Monsoon are found through out the season in Bhawanipatna, towards later part in Dharmagarh and in the beginning in Nuapada sub-division of Kalahandi district.

Table - 5 : Drought Years in Kalahandi District

Percentage of Probability

Sub-division/ District	June 75% of Normal Rainfall	June Deficit Years	July 75% of Normal Rainfall	July Deficit Years	August 75% of Normal Rainfall	August Deficit Years	September 75% of Normal Rainfall	September Deficit Years
Bhawanipatna	70	30	74	26	75	25	38	62
Dharmagarh	66	44	78	22	69	31	66	34
Nuapada	63	37	67	33	61	39	65	35
Kalahandi Dist	77	33	49	51	76	24	80	20

HYDROLOGICAL DROUGHTS

A particular year is classified as Hydrological Drought year when the annual run-off is less than 75% of the normal run-off of that particular district or sub-division. Considering the annual run-off for 15 years from 1964 to 1980 (except years 1968 & 1969), it is found that hydrological drought occurred in the years 1964,1965,1972, and 1974 in Kalahandi district. Also, as per the criteria laid down by IMD, the study of rainfall for 15 years (i.e. 1964 to 1980) revealed that the same 4 years viz. 1964,1965,1972, and 1974 were meteorological drought years. Hence, it may be seen that meteorological drought years have been hydrological drought years in the district.

Table - 6 : Surface Run-Off of Kalahandi District

Year	Run-Off in MUCM	Year	Run-Off in MUCM
1964	3739.61	1973	5709.77
1965	3116.40	1974	1442.07
1966	4797.91	1975	5027.82
1967	6444.58	1976	6719.57
1968	N.A.	1977	7135.00
1969	N.A.	1978	7242.79
1970	7960.10	1979	5505.69
1971	4719.50	1980	9399.58
1972	1116.33		
Average Run-Off			: 4032.83
No. Of hydrological drought years			4
Percentage of hydrological Drought years			: 26.67
Meteorological drought years			4
Percentage of Meteorological years			: 26.67

Deficit soil-moisture conditions in Sindhekela - Bongamunda area.



Pix : Sanjay K. Khatua.

SOIL-MOISTURE STRESS & ARIDITY INDEX : Analysis of Moisture stress in Kalahandi district in the growing seasons of the crop carried out for the period 11th June to 21st October for the years 1971 to 1980 revealed that only in one year (i.e. 1973), a moderate drought occurred. Thus, the result indicated that the district was not frequently affected by drought conditions due to erratic rainfall. But, identification of drought area using rainfall as the main parameter and ignoring other essential parameters such as Moisture, evaporation losses, crop requirements etc. cannot help in arriving at an accurate decision. Hence, the Central water Commission computed the monthly water surplus/deficit in the soil using Thornthwaite methodology for the soil for the period from 1902 to 1980 as per data availabilities for the 3-sub-divisions of Kalahandi. Based on the analysis of aridity index, in the district as a whole and all the 3-sub-divisions it was found that drought occurred in more than 20% of the total years and hence the whole district was classified as drought prone (Table - 7).

Table - 7 : Drought Occurrences as per Aridity Index

Sl. No.	Name of the Sub-Division	No. of Years Considered	No.of Years drought occurred	% of Drought years	Drought/ Non-Drought
1.	Bhawanipatna	60	27	45.00	Drought
2.	Dharmagarh	14	7	50.81	Drought
3.	Nuapada	43	24	55.81	Drought
4.	Kalahandi Dist	60	28	46.67	Drought

CROP LOSSES/AGRICULTURAL DROUGHT :

If the production falls below 75% of the normal in 20% of the years, an area can be classified as drought prone. Normally crop losses are estimated on visual inspection and personal judgment of Revenue Inspectors, which may not present a very accurate picture. However the analysis of agricultural production in Kalahandi district showed that the production was below 75% of the normal in 20% of the years accounted for the period from 1971 to 1980. It concluded that the district suffers from drought.



SOIL-VEGETATION CRUCIAL FOR PREVENTION OF DROUGHTS IN SOUTH ORISSA

The newly formed Malkangiri, Nowarangpur, Koraput, Rayagada, Gajapati and Phulbani districts of Orissa are facing regular droughts for last few decades. The greater intensity of rainfall and larger droplet size in tropical rain storms make the soil highly susceptible to erosion damage. In areas of Koraput district(old), Phulbani, parts of Ganjam as well as in Northern districts of Orissa, constant heavy precipitation during the long rainy season, heavy surface run off and percolation through soil result in leached or erosional or transportational loss, either in solution or otherwise, of small soil particles and minerals (dealt in respective chapters). This is accentuated on slopes which range from 2 to 30%. Essentially, all nutrient resources for plant growth in tropical soils are either locked up on the body of the living plants or are in the litter humus layer. In Koraput mountains region soil is very dry and highly susceptable to erosion. This characteristic of the soil-vegetation-system, implies many crucial but unexpected modulatory aspects of the hydrological cycle in tropical areas. The most important is the humidity storage in the lowest layers of the atmosphere within the forest vegetation and its insulation against wind dispersal or through heat. Albedo is higher (30-35°) over barren soils and low (15-25%) in a forest. In Koraput terrain, higher solar radiation results in rise of temperature of upper layer of air. As a consequence, there is a decline in rainfall. The actual ground water storage depends on the litter layer which is very deep under a multi-tiered natural and tropical forest vegetation. This accumulated litter fall, undergoing a process of decomposition with complex organic collides and a physical structure suitable to bind or otherwise store considerable amounts of rainfall, and in turn insulated against evaporative water loss and dessication, is actually the only bulwark against both floods and droughts. Introduction of commercial plantations, specially Eucalyptus, Acacia etc. is found taking place on a large scale (See Forest Chapter) which will be disastrous in near future. Modern tropical forestry, as well as management of agro-eco-systems, do not take into account these vulnerabilities of the tropical soil and, through intensive exploitation of the vegetation or soil nutrient depleting cropping patterns, create desertified landscapes.

In our tropical lands, the rainfall is seasonal and intense. The watersheds have steep slopes and the loss of balance in the soil-vegetation-system results in excessive discharge through rivers. This causes floods during rainy season. As the soil cover and its insulating vegetation layer are progressively destroyed, lean season discharge through rivers are curtailed drastically and the valleys suffer drought conditions.

MINING, INDUSTRIALISATION - DROUGHT IN SUNDARGARH & KEONJHAR DISTRICTS

Drought has become a regular phenomenon in Sundergarh and Keonjhar district because of the increasing trend of rainfall fluctuations since the 1950s, rapid deforestation and micro-climatic changes. Sundargarh district where holds the giant Rourkela Steel Plant and a number of medium and small scale industries, and mines occur received decennial rainfall of 129 cm, 124cm, 117cm and 132cm in the decades 1951-60, 61-70, 71-80 and 81-85 respectively. This was lower than the average rainfall of previous decades which recorded 168cm in 1911-20, 154cm of 1921-30 and 165cm of 1931-40. Sundargarh district comes under the rain shadow zone, so the rainfall was greatly influenced by forests. The impact of the steel plant, industries and mines on deforestation and the consequent climatic change as well as drought is very much obvious.

The Kharif crop of Keonjhar in 1992 received only 1070 mm of rainfall till the end of the year, though the average annual rainfall of the district is 1535mm. Dry spells after sowing and high temperature affected 15% of the Paddy, Groundnut, Maize etc. Transplantation could not be done properly. And again dry spells in September created drought condition in Champua, Jhumpura, Keonjhar and Joda blocks of Keonjhar district. Out of the total 39,000 hectares of uplands, about 30,500 hectares lost crops completely. About 50% of the 1 lakh medium lands suffered at flowering stage. Also the low lands (quality one of 40,000 and quality two of 50,000) could not give satisfactory yield. Then, the Rabi crop could not be taken up by the farmers. Cyclonic effect of sea results in rains over Keonjhar because of which it has not been so much affected by drought like that of Sundargarh district. But with expansion of mining, in the near future and further deforestation, the impact will be disastrous. On the other hand, Salandi dam is irrigating Balasore district where as the people of Keonjhar are deprived of it. Unless a watershed approach is followed and Sundergarh is taken up on a priority basis for development, the situation will worsen.



Pix : Manoj K. Pradhan

Dense Forest areas have turned into deserts.

PROCESS OF DESERTIFICATION : A CASE OF BOLANGIR DISTRICT

No trees and slope lands with poor soils, lack of moisture retention capability and erratic rainfallcause droughts.



Pix : Sanjay K. Khatua.

Rising day temperature, and falling night temperature together with the fast depleting forests and less precipation is causing a desert like condition in the Bolangir district of western Orissa. Areas between Titilagarh and Bongamunda, Sindleikela and Kholan and all around Ranipur-Jharial in the district have almost turned into a desert with the soil completely arid in nature. Desertification is a process of irreversible change of soil and vegetation of dry land in the direction of ardisation and diminution of biological productivity, which in extreme cases leads to a total destruction of biosphere potential and conversion of the land into desert. Many factors of the environment in Bolangir district signal such a trend. The mean-maximum temperature of the district has steadily increased where as the mean-minimum temperature has fallen during the same period. This situation has worsened with rapid deforestation that stands at a mere 8 percent. The vegetation of the district was reduced by 50 per cent during 1934-80. The upland valley, top and slope areas have been badly affected by soil degradation i.e. erosion, salination, impoverishment, hardening etc. ultimately leading to total destruction of the soil and its ability to support plant life.

Bolangir district was once receiving a rainfall of 2000 mm to 2100 mm in 1934. This has never increased beyond 2100 mm during 1965-80. The situation in the 1980s grew worse. A research taking into account rainfall data of 50 years since 1934 revealed that the quantum of precipitation is decreasing in every cycle of 24 years. According to a study conducted by Dr. K.L.Pujari Bolangir district has a 26-years climatic cycle and in every third year, the rainfall decreases. He also confirmed that every third year was a drought year. According to Prof.Radhamohan, a steady decline in both peak and lowest rainfall in a cycle is found in case of Bolangir district. He apprehends that if this trend continues the district will experience a rainfall of 500 mm during the first decade of the next century. Apart from a small area being covered under the Hirakud system, farmers in the rest of the district will have to forget growing rice under such circumstances. He also, says "It is high time now, that the planners and agricultural scientists of the state come forward with new crop strategies to motivate the farmers to grow millets like Bajra and Maize. This is the only alternative left to save the area from drought which has been recurring at particular intervals during the last 50 years."

Desertification induced by many factors, may be provoked by one and intensified by others. Analysis of the ecological situation and interactive factors will provide a solid basis for planning a scientific strategy against desertification and restoration of the bio-spheric potential. The seriousness of the problem is yet to be realised even by the conscious mass and the planners.

DROUGHT IN IRRIGATED AREAS

The central assumption that seems to guide DPAP is that agricultural drought is caused due to rainfall failure and expansion of irrigated agriculture is the only strategy for drought prevention and drought proofing. According to the guidelines developed by a committee headed by Dr.Swaminathan, irrigation - rainfall factor was used as a criteria to identify drought prone areas. Areas receiving average annual rainfall of 750 mm and above and having more than 30% of the net area sown under irrigation are excluded from the drought prone area programme. However, experience shows that the expansion of irrigation in drought prone areas has made agriculture more vulnerable as farmers have adopted HYV and water intensive crops and there is frequent failure of monsoon.

The newly formed Jagatsinghpur district has complains about occurrences of drought every year. In the year 1991, in spite of very good rains, all over the State all the eight blocks of this area faced drought. An estimation by "PRAJATANTRA" in July, '91 records that more than 30,000 hectares suffered from drought in an early stage. The "crop cutting" reports by revenue Inspector and Tehsildar showed a loss of 80 to 90 per cent. Also, many areas in the block suffer from both drought and floods. In November, 1992, Jagatsinghpur faced another agricultural drought. Keeping in view the water availability from L.I. points, farmers started adopting high yielding seeds and last varieties of crops but attacks of pests and insects caused harm to the production where the production was comparatively better. As a result Paddy crop in 610 hectares of Jagatsinghpur, 987 hectares of Raghunathpur, 987 hectares of Biridi Block, 1125 hectares of Balikuda block and so on were badly affected due to such attacks. Besides this many L.I points got defunct in all the blocks.

Farmers of Brahmagiri and Puri Sadar Blocks complain about failure of canal irrigation for summer paddy (Dalua). In March, 91, a number of questions were raised in the Assembly regarding this. Responding to the question, the Irrigation Minister and the Govt. Chief whip replied that the farmers did not work as per the warnings. The minister replied that, canal water was not distributed to 3-doabs out of the total 4 doabs in Puri. *Samaj* reported in 29 September, '92 that failure of "Baghra", Dhelapalhar" and "Uchheibagjhar" water distribution systems affected irrigated crop lands of about 4,000 hectares. The Hirakud canal system is not able to supply adequate water to the tail areas situated in Bolangir district.

Failure of L.I points are often reported from various places. The state of M.I.Ps are well known. And, again at times of erratic and scanty rainfalls, water is not released in sufficient quantities to meet the requirements of crops. Hydro-power generation gets more priority and due to siltation, water reservoirs are not able to hoard more water. On the other hand, commercial crops and HYV varieties need sufficient water. This conflicting situation results in drought conditions in areas which were not experiencing drought at all before.

EVOLUTION OF DROUGHT/FAMINE POLICIES

Famine Commissions were appointed in India in 1880, 1898 and 1901 to investigate the nature and causes of recurring famines, and assess the relief measures adopted and suggest guidelines for the future (Government of India, 1989). Famine Relief Codes prepared by these commissions were simply replaced by "Scarcity Relief manuals" in the post-independence period. This transition from famine to scarcity was adopted for planning relief activities when early indication of failure of agricultural production was predicted. In spite of efforts of so many decades, the relief expenditure in some of the recent droughts have increased. In 1982-83, the tune of relief expenditure was 5792.74 lakhs which included various agricultural activities like subsidies to farmers, Minor irrigation projects, subsidies to various cooperative societies dealing with fertilizer and essential commodities; supply of drinking water through the sinking of tube wells in 5012 unidentified villages and sanitary wells in 1000 villages, supply of food grains, feeding programme benefiting 1256,000; labour intensive works to provide employment to 4.8 lakh agriculture workers and veterinary measures. The question of practical implementation of these relief measures however, remains, unanswered.

In response to the drought of 1992-93 the government of Orissa allocated funds for Drought Mitigation and drought solving purposes, amounting to Rs.806.53 lakhs and Rs.779.4 lakhs respectively. It also initiated feeding programmes to benefit 18,29,050 people, generated employment under the Jawahar Rojgar Yojana, R.D, OLIC and R&B departments while also providing subsides on Agriculture and supplying food-grains through the P.D.S system. Droughts have successively ravaged the state since the great famine of 1866 and yet in 1994 AD the state has not reached any where in drought proofing.

After the prolonged drought in 1965-67, policy makers and planners realized the need for long-term benefits of the investments, not just employment generation. In 1970-71, testing of applicability of dry-land agricultural practices was initiated in 20 districts and rural works programme in 54 districts of 13 states, to create permanent assets. The 1972 drought emphasized the need for enhancing the purchasing power of the people rather than running free kitchens. In 1973 the planning commission formulated a long-term strategy of integrated agricultural development to restore ecological balance. Programmes called Drought prone Area Programme (DPAP) and Desert Development Programme (DDP) are being implemented since then in 70 districts of 13 states. In the beginning of 6th plan, a Task force was constituted to review the programmes/schemes undertaken by DPAP, its coverage, criteria for inclusion/exclusion of areas, main components of the broad strategy and linkages between DPAP and other Rural Development Programmes etc. which submitted its report in 1982-83. Then, an Inter-Development Group on DPAP/DDP was set up in 1984 which examined the representations received by the Task Force from different states. It recommended inclusion of additional 120 blocks and exclusion of 16 blocks from DPAP. Hence, there was a net addition of 104 blocks to the existing list.

During Sixth plan, the DPAP expenditure amounted to Rs.310 crores against the allocations of Rs.350 Crores. During 7th plan, the Central Government allocated its share of Rs.237 crores for DPAP. The 7th plan categorically stressed on restoration of ecological balance and increase of per capita income through effective utilization of land and other natural resources. The plan document clearly state that this programme would be implemented as an Integrated Area Development Approach means and set indicators to evaluate the impact of the programme in terms of the primary objectives of ecological restoration. The financing norms for DPAP was based on equal sharing by state and the centre. Uniformly, Rs.15 lakhs per block per annum was allocated upto 1987-88. From 1988-89 onwards, as it was continuing, blocks upto 500 sq.kms area received the same amount. Where as blocks comprising of an area of 501 sq.kms. to 1000 sq.kms were entitled for Rs.16.50 lakhs per annum and the rest for Rs.18.50 lakhs.

Implementation of Drought Prone Area Programme (DPAP) is going on for last 20 years in Orissa. Unfortunately, even though the expenditure on drought relief is increasing, ecological imbalance is taking place at a much faster rate to-day than before. With the experience gained over the years, the emphasis on famine relief should have lessened by now. This makes the fact obvious that the drought prevention efforts are inadequate. States have used "crises to ask for more and more funds from the centre". The ability of the state political leadership is measured in terms of the amount of relief funds attracted from the Central Government. The bureaucracy is trained in assessing the loss and administering relief which gets high priority whereas long term drought prevention measures are being neglected. Neither are the impact of the programmes evaluated nor are the current schemes monitored in light of eco-restoration and drought prevention. In State Assembly and Parliament sessions, hardly there are references or debates on the drought policy of the Centre and the State. The importance of formulating a **National Drought Policy** is yet to come through. Members of their respective constituencies draw the attention of the Government(s) to the conditions of the people, plead for declaration of the constituency as drought affected and demand for greater relief or failure of relief expenditure. Elections are not fought on drought issues even in worst and regularly drought affected areas. Political parties have not taken up this issue in their election campaign. Relief measures such as employment, food distribution, drinking water supply or health care are only directed towards achieving limited goals. Obviously, saving lives becomes a primary and important task during crisis situations which often result in implementation of hastily prepared schemes. Efficient and sustainable use of resources is given less importance under these circumstances. On the other hand, publicity of these circumstances have created sensations in the State and Central politics. Committees and commissions were commissioned from time to time. Chief Ministers and Prime Ministers have visited the areas for political reasons. Yet there is no sign of positive change or even any visible attempt in that direction. Considering drought as a natural hazard is valid upto a point. But, viewing it only as a visitation of nature has serious consequences for public policy. The fact that recurrence of drought and its increasing impact and intensity has a close link with the ecological degradation has to be given a sincere consideration in the policy to combat the drought & famine problem.

SOIL & WATER CONSERVATION PROGRAMME



Soil and moisture conservation is the most crucial work to restore ecological balance which is undertaken by the soil conservation department. Different plan and Non-plan schemes, JRY, DPAP, NWDPRA etc., are implemented in the drought prone areas.

NWDPRA was introduced in Bolangir district situated in the Western Central table land in 1990-91 and 18 out of 20 blocks of the district covering 86 villages and a geographical area of 21,785 hectares were selected for implementation of the scheme. Micro watershed Development approach is followed with the objective of sustainable development and restoration of ecological balance. The DPAP is under implementation in this district since 1982-83. The 8 DPAP blocks are also brought under comprehensive micro-watershed treatment. Under different schemes the soil conservation deptt. received till February 1993 an amount of about Rs.166 lakhs alone. 824 WHS' have been able to provide irrigation to 21,623 hectares of land. Without effective people's participation inadequate resources and limited scope, the impact of these programmes have not been able to bring eco-regeneration and improvement in the socio-economic life of the people.

Table - 8 : Analysis of Irrigation Development in Kalahandi and Koraput District

Sl. No.	Schemes	No.s	Area (in ha.)	Achievements until '91-92	Achievements in '91-92
1.	M.I.P.s.	32	8272		
2.	L.I.Ps	97	4300		
3.	W.H.Ss	467	9128824 nos		900 nos.
4.	Horticulture Plantation		4215		
5.	Jaladhar (Enegisation of pumpsets)				
6.	Afforestation Programme		14,167	3368 hect.	41,869 hect.
7.	Fodder Cultivation - (Animal Husbandry)		244		
8.	Psciculture	18	-		
9.	Soil Management	-	2971		41,2638.7 hect.
10.	Sericulture	-	8.00(ac.)		
11.	Project Admn.	-	-		
12.	Land Development	-		739 hect.	56,478 hect.
13.	Contour Bonding	-		186 hect.	
14.	Field Bonding	-		60 hect.	
15.	Gully Control	-		40 nos.	
16.	Farm Pond	-		5 nos.	
17.	Community irrigation wells	-		1 nos	
18.	Diversion channel drain	-	-		301 hect.

Sources : DRDA, Kalahandi, Bolangir and Koraput.

To tackle the drought problem in Koraput district of the Eastern Ghat region of Indian peninsula, two soil conservation divisions are functioning, one at Koraput and the other at Machhkund. The achievements of these divisions since its inception till 1991-92 are presented in table - 8.

The centrally sponsored NWDPRA is to be implemented in all the 42 blocks of this district during the 8th Five Year Plan. During 7th Plan, the NWDP was implemented in 4 watersheds of Laxmipur, Semiliguda, Kolnara and Nandapur blocks. For 8th Plan, an amount of Rs.25.75 crores is budgeted, i.e. more than 0.5 crore per block.

Less utility of W.H.S. Programme.



Pix : Ghani Zaman for CPSW.

AN EVALUATION OF DPAP

Drought for the purposes of DPAP is primarily interpreted as "Agricultural" rather than "Meteorological" or "Hydrological" and hence, programmes such as soil and moisture conservation, water resource development, fisheries, forestry and horticulture, animal husbandry, etc. have been undertaken under this programme for the last 20-years. However, the results are far from satisfactory. The Agriculture and Co-operative Deptts. of Govt. of Orissa admitted failure after making an appraisal of the programme. It stated that there has been no perceptible impact on achieving "Drought Proofing" in the DPAP areas on any significant scale. It pointed out the lack of a comprehensive policy and an integrated approach to the whole programme. For example, schemes like land shaping, bunding, construction of W.H.S etc. are meaningful only when they are taken up in conjunction with primarily agricultural schemes such as crop substitution and change of cropping pattern etc. High land paddy and paddy resistant to moisture stress, may be substituted on large scale by normal paddy which is vulnerable to moisture stress. Likewise, the Deptt. listed out the following seven reasons for which the programme could not be successful :

1. The core objective of "Drought proofing" did not receive much focus in the initial years. Hence, many schemes implemented under DPAP proved positively detrimental to the central objective e.g. distribution of grazing animals such as goats & sheep contributed to further loss of forests etc.

2. Instead of intensive investment in a limited micro-watershed area, expenditure has been incurred in diverse schemes in a wide area, and so, it has not been possible to achieve any significant results.

3. Many schemes such as provision of equipments for cold storage plants, construction of buildings, etc. not directly related to the primary objective were taken up.

4. Co-ordination between DPAP and normal development programmes could not be achieved.

5. Lack of funds for maintenance and repair of projects executed earlier, left the projects unused and useless.

6. Peoples participation in formulation and implementation of schemes has been minimal, though people's representatives are members of the DRDA governing bodies.

7. Regulation flow of funds to DRDAs from Central and State Govts. has not been smooth adversely affecting implementation of various seasonal programmes such as afforestation, horticulture etc.

RECOMMENDATIONS OF THE EVALUATION : Some of the important recommendations made by the evaluation are the followings :

1. Watershed Management Approach should form the core of DPAP. So, preparation of detailed Mini/Micro watershed plan for all the DPAP blocks in a time frame is very important. Wherever a mini/micro watershed is selected, its treatment must follow from the "Ridge to Valley" approach.

2. Sectoral weightage for allocation of funds should evolve from a comprehensive watershed planning process.

3. It is necessary to pool resources for drought proofing from all departmental and non-departmental schemes. DPAP should not be treated as an isolated programme with limited objectives, but as the main integrating unit for sustainable development.

4. All farm land situated in identified watersheds in DPAP areas, need to be systematically developed.

Provision of assistance and subsidies should be decided differentially to marginal farmers, small farmers, and big farmers. The big farmers should pay at least 50% of the investments where as landless (who should be provided with some land) and marginal farmers may be assisted fully. The definition of such groups may be re-worked out in a drought context, where even 5 acres produce very little. Land holding in command areas should be separately considered.

5. Transfer of Dry land Technology to the farmers is essential for drought prone areas and this should be demonstrated on pilot project basis at the expense of the Government.

6. People's participation in formulation and implementation of the watershed management programme is vital. This capacity of the people should be so developed that they will exercise greater control over the decision-making and own the programme.

A last minute struggle to protect the crops in Bhuinpur village in Aulblock.



Pix : Eastern Media.

KALAHANDI : A HUMAN FAILURE

At times of "emergency" or "scarcity", the immediate response from planners, politicians and administrators has invariably been "relief" or some increase in the financial allocations under the hackneyed schemes named and renamed to suit the changing fancies of the political parties in power, says the Khariar road based veteran *social worker Sri A. V.Swamy*. When the "emergency" which has become an integral part of socio-economic milieu of the region is temporarily over, everybody including the victims go to bed as if nothing has happened. This drama of distress and denigrating doling has become a part of the local culture and hence a repetition is never questioned. He adds that Kalahandi's problem is not that simple to be solved by a politician; a bureaucrat or a technocrat - all of who have been equally, if not very consciously, responsible for the present state.

Sri Achyut Das, another veteran social worker and member of the present State Planning Board says that "Development Process in Kalahandi with various packages of schemes, subsidies, target, official procedures and implementation strategies have not achieved the designed result. The failure is crystal".

Dominant Feudalistic Culture : Sri A.V. Swamy analysed Kalahandi's under development and wrote, "Nearly 25 years out of 43 years of normal post independent development activity was deliberately denied this region. Because of pre-independence loyalties, the zamindars and their feudal siblings went as peoples representatives and the party in power then saw to it that no significant development activity occurred in the area represented by their antagonists. This neglect by the party in power has in fact helped in returning the very same representatives. In this process of parties fighting for carving out expanding areas of influence, the local people lost about 25 years of prime development period until new political equations emerged. The *dominant feudalistic culture* which the local people accepted due to years of subjugation under the zamindar system vastly retarded even the subsequent development initiatives of the state and central governments to ameliorate the social and economic condition of the poor. *This has been and remains the major constraint for development.*

IMMEDIATE SURVIVAL & LONG-TERM ECO-RESTORATION

Agricultural-labourers households constitute 40% of all households in the category called "Rock Bottom Physical Existence". Life of the critically poor is characterized by poor health, illiteracy, low status, insecurity and low levels of consumption. In fact they form a vicious circle. Low consumption levels have implications on production and susceptibility to diseases. Besides, the calorie deficiency of protein and other nutrients make the conditions of the rural labourer households miserable. Employment programmes planned and implemented in the right-time (not hastily at times of scarcity and deaths) can bring long-term development and ecological stability.

Employment Guarantee Programme : Sri Aurobindo Behera, who was the district collector of Kalahandi earlier advocates an employment guarantee programme for the poorest of the poor for whom other programmes including IRDP have only limited relevance. Considering the resource constraints of the state, such a programme can be targeted towards the most backward areas, priority groups and distress timings of the year. He feels that the wage rate in Kalahandi being relatively low, the employment programmes will have the effect of stabilizing the wage rate at a higher level. This effort should be supplemented by public distribution system and its effective targeting. He feels it would be ideal if the wage employment programmes have a grain component in them and the officials ensure that the grains are not siphoned of by the middlemen.

Public Distribution System : In times of drought there is a collapse of the public distribution system. Even though 51.60% of the country's poor are in Bihar, M.P, Orissa, Rajasthan and U.P, they receive only 18.90% of food grains. (D.T.E. Vol2 No2 June 15,1993). In Koraput district (Undivided) the PDS needs 4000 metric tonnes a day which it does not get even in a month. The supply is therefore 3 kg per family, per week (Hindustan Times 26.5.88). Though gratuitous relief of uncooked rice, wheat, ragi, or maize at rate of 250gm per day per adult and 170 grams per day per child is to be given the beneficiaries sometimes people get as low as 160 grm an adult and 70 gm per child as happened in 87-88 (Hindustan Times 26.05.88). Many a time it so happens that the beneficiaries are not the landless poor but the big farmers. Sometimes P.D.S, relief and feeding programmes never reach remote villages where death stalks the doors of the aged and infirm who cannot walk to the centres for their quota of food. If they do not get any share from kith and kin their state sometimes leads to death. The feeding programme known as "CARE FEEDING" and the proposed Nutrition programme sponsored by UNICEF should take into account the food habits of the local people and the availability of food grains surplus in the local area. People should be able to manage it themselves and illicit trade on this should be completely checked.

Local Foodgrains Procurement : Kalahandi, the chronic drought prone district of Orissa is one of the highest contributors of the state to the central pool. In drought hit 1992, out of the total 2,52,419 tones procured by the F.C.I as on August 31.1992; Koraput and Kalahandi had supplied 28,195 and 19,913 mt tonnes of food grains respectively. And when this is back at Kalahandi, through the Public Distribution system, the ration shop delivers paltry doles to the poor, if at all. The government policy of management, procurement, allocation and distribution of food grains is very unjust.



Pix : Manoj K.Pradhan.

A storage technology developed by Agragamee, Kashipur and managed by the people.

CONTINGENT CROP PLANNING

Agriculture is the major source of absorbing the increasing population in Kalahandi district. The land use pattern indicates that no more land could be brought under cultivation except the current fallows. The only alternative left for meeting the food-grains requirement for 18,63,271 population by 2000 A.D. is to increase the area by diversification of cropping pattern and by adoption of multiple cropping. The following is suggested to meet the unforeseen situation caused by the changes in weather conditions, erratic nature of rainfall and frequent occurrence of drought affecting different stages of crop growth resulting in instability of production.

If no rains occur till last week of June, sowing of upland paddy in unbunded high land should be avoided and maize, ragi, jower, arhar, groundnut, sesamum, castor in lines should be done. (Some of those crops can be sown upto second week of July). In case of bunded uplands short duration varieties of 85-100 days paddy may be sown. Low lands can follow usual package of practices. Sowing of spreading types of groundnuts can take place in up-lands.

In case of failure of rains till early part of July, crops like Bajra, Jower, Biri (T-9) Green gram, Sesamum and Castor are suggested. Jower can perform better than Bajra. Ragi or Castor can be sown during July, Maize by middle of July and Groundnut by end of July.

When, rains are delayed till last week of July, it is not advisable to grow groundnut, Bajra or Jower (Green type)

If rains are delayed beyond end of July, Sesamum, Castor and Jower are suggested for cultivation. Early variety of rice, arhar groundnut, green gram, black gram, short duration jower during July as sole crop; and Jower-arhar (2:1), and soybean + arhar (2:1) as inter-crop. Castor (Aruna) during August and some varieties of arhar can be grown during September. Inter-cropping be adopted as an insurance against total failure. Better systems are Jower (CHS-6 + arhar). Maize (early maturing) + castor or green gram or black gram ; Arhar + groundnut (1:4 or 2:5). Conservation and carry over of moisture for Rabi crops and early sowing of Bengal gram varieties, Sunflower, Mustard as early as first fortnight of September etc.

NORMAL ONSET OF MONSOON FOLLOWED BY LONG DRY SPELL

This is the main problem of drought in West Orissa. If drought sets in during July, effective weed management and resowing of crops by early varieties with 10-15% higher seed rate are practiced.

In case, upland rice is completely damaged, then the crop may be cut down for cattle feeding or dismantled for sowing of some varieties of Arhar, Green gram, Black gram, cow pea or sesamum. If possibilities of survival remains, some varieties of Arhar or Castor could be dibbled inside the standing crop in August-September at 60/30 cm. spacing. If prolonged dry spell prevails during late August or early September, crops like Jower, Bajra and Maize may be harvested for fodder or plant stand may apparently be thinned depending upon intensity of drought.

In medium lands, seedlings of short duration can be raised quickly using "Depog" method and older seedlings of 50 days or medium duration varieties may be transplanted on receipt of rains. In areas with good drainage, Arhar, sunflower, Black gram may be planted in September in case rice crop fails.

In low lands, since, submergence is a problem, only rice crop is suitable. Late transplanting with comparatively shorter duration varieties of pulses like gram or field pea may be sown in October in case of failure of the main paddy crop. Green gram (Nayagarh local, Berhampur local) can also be grown.

Indigenous varieties which have great potential for drought resistance can be used. Besides trial of different cropping practices and varieties, few other steps can be followed to reduce the severity of drought conditions. There is a great need for such contingent planning and its successful implementation.

CREDIT AGAINST DISTRESS SALES & ECO-REGENERATION :

Credit availability is the most essential thing at times of scarcity to prevent alienation of land and other assets. Loans from sahukars, gountias and middlemen forces the small and marginal farmers to sell their produces at throw away prices or crop fields of lump sum money called "Green Selling". So, whatever the farmers could have received in return for crops and survived from the chronic seasonal hunger, is not possible. Prolonged indebtedness makes them vulnerable to various exploitive and oppressive situations. Also, if a drought occurs and the crop fails, the farmers have no resources for re-planting or sowing, hence allowing fields to go uncultivated. On the other hand, credit for tank renovation, W.H.S. construction, tree planning, terracing etc. is not available. It therefore, becomes essential to provide sustainable and integrated development. The cooperative movement which primarily aimed at extending credit and eliminating middlemen exploitation has miserably failed. People are not getting money to invest in the agricultural sector. The small experiments and efforts by voluntary organisations (VOs) initiated by villagers, specially women's groups, in the form of small thrift and credit societies are far more effective, as they are owned and managed by the people themselves and there remains a great amount of collective accountability among the members. Traditionally existing village funds are now being revived by VOs. (i.e. Gaon Panthi o r Kotha dhana). Villagers themselves maintain the records and savings books. The "Mahila Gramin Bank" promoted by PREM (People's Rural Education Movement), a voluntary organisation working in Gajapati district is a revolutionary concept. Village level revolving funds is also a very popular concept among VOs. This programme run by VOs is definitely successful in its own way. But it is doubtful, whether these efforts can really meet the credit needs of the people. Collective credit needs at times of scarcity and for economic investments are too high to be tackled through this way without touching the state's available credit and finance, through its institutions. One can not ignore that. Table - 11 gives a picture of this in the drought areas.

Another problem which needs careful handling is villagers sensitivity to corruption. A slight suspicion creates a lot of conflict and group dynamics. Hence, conflict resolution at the earliest makes the programme run. In cases where credit is utilised for economic purposes, then, proper marketing of the products can only enable the persons to repay the loans on time. The credit amount available today is quite big. What is needed is proper utilisation, sustainable impact, repayment and collective accountability of people which has to be institutionalised. Government and banking institutions should go beyond their scope to make it a people's movement and help avail it, for long-term eco-regeneration.

TABLE - 9 : Credit & Finance Availability (in lakhs)

Sample Districts	Cooperative Societies No.s	Working capital	Schedule Commercial Banks No. of Branches	Deposits	Credit
Bolangir (1986-87)	405	4680	89	3312	4484
Phulbani (1989-90)	102	3199	59	2754	2026
Koraput (1986-87)	230	4756	143	7073	7102
Sundargarh('88-89-90	330	4998	108	24585	13363

In Kalahandi district (old), there exist 40 Commercial Bank to which 64 Rural Banks are attached. There are also 13 Central Cooperative Bank branches controlling 171 primary agricultural cooperative societies. Further, each of the 3 earlier sub-divisions has a primary Land Development Bank advancing long-term loans. In Bolangir, there are 14 such branches and 43 Mini Banks. Last year, until the Kharif season, they were able to lend 150 lakhs to the farmers and had targeted an amount of Rs.200 crores for the Rabi season against the deposits received to the extent of Rs.8 crores (urban) and 80.47 lakhs (Rural). These achievements are definitely very rewarding. But, the poorest and marginal sections have very little access to these credits. The Banking policies and lending priorities as well as rules need to suit the requirement of these sections more.

DROUGHT PROOFING MEASURES NEED A COMPREHENSIVE & LONG TERM PLANNING

Many Programmes/Projects aimed at environmental conservation have ended as dismal failures because the simple fact that production and local security are inextricably linked with conservation and environment has been ignored. A simple example is that of poor people cutting and selling firewood for their bare subsistence. Unless these people are provided with some alternatives, they will not depart from this destructive practice. The established solutions to environmental problems are often based on a sectoral approach, at a macro level, where the problems and views of the local population hardly enter the picture. The problem is seen as a technical one and the solutions deal with the symptoms rather than the disease itself. All development efforts have to be coordinated and planned with a long term perspective, DPAP alone is not enough to restore the eco-balance.

Table - 10 : Allocations under DPAP in the 8th Plan

Sector	Percentage of allocation	Total Allocation (in lakhs)
1. Soil & Moisture Conservation	30%	1381.20
2. Water Resource Dev.	20%	920.80
3. Afforestation	25%	1151.00
4. Other Activities	15%	690.60
5. Project Administration	10%	460.40
Total	100%	4604.00

Source: Eight Plan,1992-97 & Annual Plan 1992-93, ORISSA, Vol.I

Land & Water management, afforestation, fodder development and socio-economic issues should together from the basis of this planning and special measures should be designed keeping area specific problems and needs of people.

PROTECTIVE IRRIGATION

Protective irrigation is considered to be the solution to protect crops from shortage of rainfall during drought years. Construction of W.H.S., tanks, chabalas, canal, wells etc. are taken up by different agencies, besides major & medium irrigation development (discussed in Water Chapter).

M.I.Ps in Sinapalli block give some insight. The one constructed in Kodabeda, Sinapalli is used for drinking. Whenever irrigation was done, conflicts took place among different user groups. In case of Karanvali, the "Gauntia" who had land below the structure is using it alone. The one in Khandapara is useful, but for the nearby "Para" for whom it was not actually constructed. The only one in Khairapadar is useful to some extent. At present, this is primarily used by villagers of Sradhapur who are powerful and big farmers. Hence, the original purpose of giving water to the poor farmers of Khairpadar was lost.

In Sankri village of Jharbandha Block, a Bund (i.e. Huda) was first constructed in 1979 with Rs.25,000/-. Later on, the villagers contributed their labour of about Rs.25,000/- to Rs.30,000/- and added to the work done earlier. Later, another Rs.25,000/- was spent for completion of the work. But in 1992, the rupture was washed away. Now, there is no maintenance. Almost 300 acres out of 400 acres of the village land was getting irrigation out of this. In Kasipani village of the same block a Check dam was constructed in 1988 with the assistance of a NGO. The village Gountia donated 5-acres of land for this purpose. It was found that the Gountia families own all the 20 acres of land below the structure which gets most of the water in Kharif.

Issues : Bunds and W.H.S. tanks mostly benefit the low lands which are owned by the Gountia families and other big farmers, except in a few cases. Adequate financial provision is not made



Pix : Sanjay K. Khatua.

People store enough seeds for contingencies - the way to cope with disaster.

to complete the works. Enough attention is not given to the distribution and management of water. Sometimes, as in case of Khairpadar, the nearby villages whose land also come near that stream/Nula, try to steal the water and disrupt the structure. Such factors should be taken into account while planning for such schemes. The ownership of structures is vested with the Panchayat, the Irrigation Department and the big landlords like the Gountias who donate land for these purposes, thereby creating water use conflicts. Maintenance of the assets created is not taken seriously. Suitable systems should be developed for regular maintenance and funds should be available for repair at times of damage.

The "Chahala Model" was studied in few cases such as "Kandulkona", "Dhingiamunda" of Sinapalli block and found to be an idea which could be tried for medium, low lands, and could be possible for uplands,once the land is leveled. In such a case, few farmers may form a user group and the chahala can be located in a suitable place. In case of Kandulkona, 4 farmers were able to irrigate 5-6 acres of land around the chahala. In case of "Dhingia munda", 3 families were able to irrigate upto 10-12 acres in Kharif season. Rabi crops were tried in both the cases. Pisciculture is also possible in these small structures which can give a good return to the landless. Cost-wise this seems quite feasible.

Small "Chuas" cost only Rs.200/- -Rs.500/- which are constructed every year during vegetable cultivation and covered up after that. These can be tried in every farm as a protective measure. This is surely a low cost model.

Table - 11 : Allocation of DPAP Funds in 8th Plan (1992-97)
(in crores)

District	No. of Blocks	Total * Allocation
1. Bolangir	08	9.44
2. Kalahandi	11	13.00
3. Phulbani	14	16.52
4. Sambalpur	06	7.08
Total	39	46.04

Source : Eight Plan, 1992-97 & Annual Plan 1992-93,ORISSA,VOL.II.

* Total allocation is shared is 50:50 by State & Central Govt.

AFFORESTATION

On the basis of vegetation and rainfall studies of 29 stations for over 100 years, Meher-Homji (1986) has shown that, as a rule, the larger the area of deforestation, the more the number of criteria showing diminishing tendency of rainfall and rainy days. The results of increased exploitation of catchment forests and their conversion into profitable monoculture plantations of commercial species like Pine or Eucalyptus have been a major cause for the creation of floods and drought in India (Bandyopadhyay 1985). This is being undertaken on a massive scale in the old Koraput district and other hill slopes and catchments.

Shiva and Bandyopadhyay (1986) have pointed out that Pine and Eucalyptus fail to provide adequate defense to the soil against the direct hit of the rain drops during intense storms. Their ecological instability also comes from their very poor contribution to humus formation as against broad leaved species. Finally, Eucalyptus plantation, by virtue of being sclerophitic takes away through evapotranspiration, a major portion of the moisture remaining in the soil. As a result of the cumulative impact of these processes over 10 years, the water yield of experimental plots in the Nilgiris showed a significant decrease when the natural Shola forests and grasslands were replaced by Eucalyptus plantations (Gupta, 1986).

The whole of Machhkund Basin and other plateau and hill regions of Orissa are brought under Eucalyptus plantations. As such, the upper catchments are within the single eco-zone of the same river basins and their ecological performance is most vital for controlling floods and droughts. Bailey et al (1985) cite an experimental comparative study of catchments in Madagascar between natural forests, secondary forests and Eucalyptus plantations, where it has been observed that flood was 20% higher in the case of Eucalyptus plantations which had the least base flow. In the case of natural and secondary forests, about 50% of the rainfall contributed to base flow while for Eucalyptus it was only 4% to 19%. Similarly chir pine in the Himalayan watersheds increase vulnerability to floods and drought. Long before the Chipko movement, Mira Behn, disciple of Mahatma Gandhi, took up this issue, voiced the threat posed to surface water resources by the replacement of Oak forests by Chir pine (Shiva and Bandyopadhyay 1987). Other important factors contributing to hydrological instability of the upland watersheds include ecologically hazardous mining in the Panchpatmali hills, Niyamgiri hill ranges of Koraput etc,Industries like NALCO at Damonjodi, Therubali (IMFA), Hal at Sunabeda, and those at Rayagada and Jeypore, Rail ways and reckless roads construction, overgrazing and growth of non-terraced agriculture, shifting cultivation, dams etc.

PASTURALISM & ECOLOGICAL STRESS

Herds are an important component of our rural economy. Social security arising out of drought and deforestation forces, landless and small peasants to rear more domestic animals. Once the population and livestock growth reaches a point (i.e. the maximum point of carrying capacity), the resilience of the local ecology starts to break. This is the case in some of our drought prone areas.

Tribals, specially Koyas of Malkangiri who are traditionally nomadic pastoralists, rear a number of animals. Some tribals are also beef-eaters. Cattle health is found to be very good when a lot of good vegetation is found in the forests or there are good forests nearby. Recently, the Nowarangapur district collector has launched a scheme called "Kamadenu Yojana". Bolangir district being one of the most drought affected district posses as many as 11,94,512 animals as per the last census. This district is famous for development of sheepery. Next to Ganjam, Bolangir district rears 2,40,000 sheep and 3,93,000 goats. To meet the demand, ***Fodder Cultivation*** is promoted in Titlagarh, Patnagarh and Sindhekela areas. Interested shepherd and milkmen are supplied with 500 kg grass seeds and 22,000 number of fodder seedlings. Yet, 50,000 Sua-babul trees have been planted to produce food for the animals. In Ganjam and Gajapati districts, the Indo-Swiss Diary Development Project is working for a revolution in milk production.

Livestock including work oxen mainly survive on natural herbage. In the dry season, stubble and weed grazing is allowed. Also, some crop residue is provided as feed. The expansion of cultivation to grazing, forest and wastelands continuously diminishes the areas available for grazing. Together with the absence of fodder production, the cattle productivity decreases.

DUGWELL IRRIGATION & ONION GROWERS OF WEST ORISSA

In a large number of villages in Kalahandi, Nuapada and Bolangir districts the water table is very high. Hence people dig temporary wells to grow summer crops. It hardly requires Rs.100/- to have a well. One can see thousands of such wells in this region. The diameter of these wells vary from 3'to 5' They are not lined. The depth varies from 6' to 10' and can irrigate 0.25 acre to 1-00 acre.

Government agencies have been liberally financing Dug wells. Projects like 'JALA DHARA' 'JEEVAN DHARA' 'MILLON WELLS PROGRAMME' etc. are on the anvil. At the end, the officials, the voluntary agency workers, and the bankers, all get frustrated when they observe that the beneficiaries of all these wells are not growing any vegetable using the well. Very often the farmers are branded as 'lazy' 'easy going' and so on. The officials don't understand why the farmers take liberal loans and yet do not utilize them for wells.

The Onion Farmers : Thakur Das Mahananda of village Pudapalli in Khariar block had been growing onion during 1985-92. In May 1992 he went to sell 400 kgs of onion in the Kurumpuri market (50 km from his village), transporting it by his bullock cart. But he could not get a single buyer. There he thought if the onion is transported back home the bullocks may die on the way. Finally he dumped all the onions in a field and returned to the village in empty hand and empty stomach. Can we expect Thakur Das to grow onion again in next 1-2 years ?



Pix : Jagadish Pradhan

"Chua" irrigation & Onion growers in west Orissa.



Pix : Jagadish Pradhan

Just 200 to 500 rupees for a chua and all family members work.

Daitari Hans and Jagadish Hans of village Bankapur in Khariar block have 2.5 acres of low land. They are among the 70-80 families of Bankapur who have been growing onions for last 15-20 years. To grow 0.25 acre of onion he incurs an expenses of Rs.645/- for the crop.

Expected yield of onion is between 1200 kg to 1400kg, on an average 1300 kg. which fetches (1300 kg x Rs.1/-) Rs.1300/- total (the rate being Rs.0.80 to Rs.1.20 p). So the net earning of two persons in 135 days comes to Rs.655/- or Rs.2.42 earning per day. The nearest onion market for Bankapur is Kantabanji which is 33 km away. It takes almost 3 days (to and fro) travel by bullock cart to transport and sell 4 quintal of onion. In Kantabanji also there is no guarantee l of all the onions can be sold. Very often the traders unite and slash down the rate. In this situation what is the significance of million wells or the significance of drought relief in this region ?



Pix : Ghani Zaman for CPSW

Well irrigation - great potential unexploited.

TOWARDS ENVIRONMENTAL SUSTAINABILITY

The interplay between community needs and long-term environmental requirements means that conflicts over key natural resources must be looked at from both a regional and family perspective. The most vulnerable people in our countries are often accused of destroying forests and fragile eco-systems and of practising destructive forms of agriculture and animal husbandry. The contradiction in this is that people in desperate situations, faced with the threat of starvation and unemployment, do not respect laws, democratic ideals or norms. Thus, improved living standards through more reliable production or other means, are a key to environmental sustainability.

ALTERNATIVE TECHNOLOGY

The decreasing ability of peasants to feed themselves is also related to technological stagnation. In uplands, soil preparation is done by ox-drawn ploughs whereas most other operations are done by hand, using Hoes and Sickles. The frequency of cultivation and crop practice were totally different in earlier times. Now, the fields are kept continuously cultivated or used for grazing. The present form of cultivation practice encourages erosion.

When on one hand the nutrients of the soil are gradually being lost, there seem to be very little knowledge about restoring it. Planting of nitrogen fixing trees and crops, humus formation in the field, bio-manuring, pest control, moisture conservation, terracing, integrated planning of agriculture-livestock-pisciculture-forestry and so on can increase the carrying capacity of land, meet the population pressure and the increased needs as well as making the development process sustainable. Few such experiments have begun, but this needs to be made a people's movement.

AN INTEGRATED WATERSHED APPROACH

The traditional irrigation system in Kalahandi has always been based on micro watershed development. So the extension of the micro watershed development could bring a revolutionary change in Kalahandi. Because of the typical landscape of Kalahandi, most of the villages form a number of micro watersheds and there is therefore a tremendous potential for their development which could provide protective irrigation during the Kharif and winter harvest seasons. In fact the farmers have been developing the micro watersheds quite scientifically. This was discontinued after government interventions. Impoverishment of the farmers in the post independence period has also been another reason. A rough estimate shows that to develop the micro water sheds in the non-irrigated areas of Kalahandi and provide protective irrigation to about 80% of the cultivable land in the district, an amount of Rs.5,000 million will be required. This is about half the cost of the Indravati Irrigation Project and can be spent over a period of 10 years. This will also create additional employment for 300,000 persons every year. The food production can be multiplied by 4-5 times and the returns will be enormous as estimates Sri Jagadish Pradhan. This strategy will also pave the way for development of industries, trade and commerce in the district. Kalahandi alone has the potential of producing an extra one million tonne of food-grains, if the micro-watersheds are properly developed. Mr. Pradhan demands closure of all the medium/major irrigation projects which are in the pipeline because these projects will only increase regional disparity and adversely effect the people and agricultural productivity.

It is necessary to ensure a proper marketing and pricing of agricultural crops, by providing support services to the farmers. There has been no cold storage and other infrastructures in the district for which Onions, Potatoes and other vegetables and fruits of the district are procured by the traders at throw-away prices and exported to Raipur to be imported later for sale at high prices in Kalahandi. The nexus between politicians, traders and the bureaucracy has to be destroyed. This entails a long term process of political and social education of the people for this alone holds the key to development in the district.

REVIVAL OF INDIGENOUS LAND-WATER-CROP MANAGEMENT PRACTICES

Considering the nature of the rainfall, and soil conditions, naturally regenerating, vegetation, indigenously adopted cropping practice and water management techniques were evolved in Kalahandi by the farmers. People's knowledge and skills were not only very scientific but appropriate to their environment. Water and soil conservation, suitable cropping patterns and so on were practiced in earlier times, yet today this is not recognized by modern science and development, hence, resulting in complete degradation of the practices.

The traditional land and water management system in West Orissa was based on "Micro-watershed approach" consisting of more than 2 villages. At the highest contour line, was the water harvesting structure, called "Munda" (in Oriya, the end is called "Munda"). Bundhs were made on the lower side of the slope with waste-weir on one side, to allow the excess water to flow to the low-lands. The normal site of the mundas were on the contour lines. The W.H.S', or "Katas" were comparatively bigger in size. They provided protective irrigation at times of water scarcity. Water to the paddy land situated below was taken by simply cutting the Bundh. There were also small tanks irrigating 4 to 8 acres of land around each tank. Village ponds and "Check dams" were yet other village water sources which had multipurpose used. Such low cost and viable structures existed in the villages till the time of Independence after which they deteriorated due to lack of maintenance.

In situ conservation of water-soil and trees on farm bunds - the way people manage drought (Kalahandi).



Pix : Manoj K.Pradhan.

PROMOTION OF DRY LAND AGRICULTURE

Dryland farming with Short-duration paddy and millet crops must be retained.



Pix : Ghani Zaman for CPSW.

There is an alround effort to promote dry land agriculture in drought prone areas. After organising technical workshops, OXFAM assisted the local organisations for dry land seeds. The farmers as such are practicing this method since long. Certain mixed farming practices and crop rotation techniques being tried are found to be very useful. Cotton & black gram was distributed for mixed farming. But this failed due to scarcity. In some places, a new variety of Blackgram (called "Tola") is under practice. A new high yielding and short duration "Ragi" is also cultivated and harvested in September, instead of October, as it was earlier. In Jharbandh block, Ground nut cultivation did not exist. It was first introduced by a village Gountia and later on, after OXFAM assisted this, it is widely cultivated in that area.

Farmers have developed their own ways of coping with drought situation. In uplands, Pora, Kulia, Setka, Sekra, Jhari, Gunuji, Kodua, Ragi etc. are being cultivated by farmers. In medium lands, Chinger, Nenaka, Kalikhuku, Karigudi and other drought resistant varieties are cultivated. In bahal lands, Sakri and Jhili are the short duration varieties cultivated. If rain stops at mid of July, some times paddy (after seeding) is sown. Sakri in place of Jhili, Huna & Kalijubi in place of Sakri are sown by farmers. Such indigenous practices of people should be documented, studied & improved for better cropping pattern and yield.

"Seed Bank" concept to promote a well designed dry land agriculture should be working, specially at times of contingencies, there is greater need for this. Unless "Scarcity" conditions are met with other assistance farmers eat away the seeds and the programme fails. Drought resistant varieties and Dry land farming is most essential for a sustainable agriculture.

CLOSING OF HILL SIDES :- Though official rules and classification of forests as reserved or protected could not protect degraded hill sides, the efforts of communities in many places of Orissa, initiated spontaneously, motivated by scarcity reasons and of late, recognized by the Government are very successful in preventing grazing, fuelwood collection and timber felling. There are also many instances where people have confrontations with smugglers and forest officials. The result of these protection efforts are very impressive. There are even youth clubs and village committees who are able to deposit upto Rs.25,000 in their common funds generated out of the sale of dry leaves and branches. In all these cases, vegetation is returning within few years and the ecological impact is quite visible. Villagers together develop their own systems of management and distribution to meet their requirements. However, species with low palatability and nutritional values tend to dominate. On the other hand, plantations are further reducing growth of grass. Another problem is that grazing pressure and even firewood collection pressure are transferred to nearby hill sides. Yet, most of these Bana Sarankhyana Samities (Forest Protection Committees) lack articulate management plans.

SUGARCANE REVOLUTION/DEVOLUTION

In Kalahandi as well as other drought prone districts a number of indigenous varieties of crops were cultivated. These varieties were drought resistant. People also stored surplus produces of normal years as security against the scarcity of the drought years. Grains production constituted more than 80% of the total cultivated area of 7,62,000 hectares. Drought resistant and dry-land crops like Jowar, Rai and other millets were grown along with pulses like Mung, grams, Arhar etc. in unbunded and up/medium lands covering upto 40% of the total cropped area. Yet among farmers now, there is a strong tendency towards paddy cultivation. After a land is levelled and bunded, the poor farmers opt for paddy. So the area under paddy stands at 40% of the gross cropped area in Kalahandi. Introduction of high yielding varieties of crops has definitely increased the yield, but has become susceptible to drought. In a recurring drought situation, the local rice varieties like *Banko* in Bolangir, *Bobil Khumta* and *Mahulakunchi* in Kalahandi, *Chittikona* in Koraput and *Saprula* in Phulbani were high yielding as well as drought resistant. The land under cultivation has increased considerably in these hill districts, basically clearing forest lands, wastelands, and other uplands. In these lands, people cultivate millets and oilseeds of local varieties. Now, introduction of HYV of millets, oil seeds and rice, is making agriculture more vulnerable to drought situations. The drought thus created is an artificial one.

High water consuming sugar cane cultivation is now being encouraged in Kalahandi, Nowarangpur and Bolangir districts. The expansion of land irrigation from Indravati and other projects are attracting sugar Industries from various states of India. Sugar cane cultivation even in a most drought year 1987-88 took place to the extent of 4,500 2,070 and 7,340 hectares in Bolangir, Kalahandi and Koraput districts respectively. The production from these three district were 31,510 and 35,240 M.T.s respectively. Now, heavy subsidy and assistance is provided in addition to the extension work of the Sugar Industries in such areas. Rich farmers being losers in the drought-prone agriculture are greatly pressurised to take up sugar cane cultivation. While the sugarcane industries will not face any loss the small & marginal farmers will be immediately affected and the rich farmers little later. This Is the experience in Maharashtra and other parts of the country.

LAND REFORMS

Big farmers occupy a large chunk of good lands



Pix : Sanjay K. Khatua

Sri Aurobindo Behera who was the district collector of Kalahandi states that a substantial portion of the population in Kalahandi district remains below the poverty line and that there is a group of ultra poor whose condition borders on destitution even in normal times. Despite implementation of target group oriented anti-poverty programmes, families under the so called poverty line have not benefited equally as has been found through various studies and evaluations.

Sri Behera further opines that poverty cannot be removed from Kalahandi by increasing the irrigated area and thereby increasing production. As the land distribution in Kalahandi is extremely skewed increase of irrigation area will only result in under utilization of irrigation water. A study reveals that even in the Lift Irrigation Sector, utilization of area per L.I. point did not increase appreciably despite the increase in the number of points installed. Land alienation by the poor households especially belonging to the scheduled tribe families is a persistent problem in most of the backward districts including Kalahandi. Similarly in all the target group oriented programmes such as IIDA, MADA, Micro-Project etc., the important consideration should be food security and sustainability.

The number of land holdings above 10 acres are said to be the largest in Kalahandi compared to any other districts of the state, not to mention the hundred of acres held by many, breaking all cannons of land ceiling laws with the active connivance of the local administration. The official figures do not give a correct picture. Even, the official land holding statistics (Table - 12) of the district shows that nearly 36% of the area where 1.4% operate as much as 11% of the area. Also, the average size of holdings of these 11% comes to 15.2 hectares each. This shows that there is concentration of land ownership in the hands of big landlords - "Gountias". What is much more important in this connection is that all the large land owners possess the best quality of land called "Bahal Jami" which are protected from droughts and exploit all the community's water bodies. On the other hand, the unbunded uplands are owned by the poor and marginal households who suffer badly when there is a drought. Though distribution of ceiling surplus land and Govt. wasteland has reduced the inequality in land holding officially, actual demarcation and possession of land has not taken place. Land alienation due to distress conditions has reduced the landholding of the tribals and made many households landless. Such transfer of land from tribals to non-tribals takes places through fraud. Large scale land transfers to non-Oriyas are also reported on the Upper Indravati Canal irrigation command areas.

Table - 12 : Unequal Land Holding in Kalahandi

Economic Class	% of holdings	% of area	Av.Size of holding (ha)
Marginal	35.7	9.9	0.6
Small	28.3	18.8	1.4
Semi - Medium	25.7	30.4	2.6
Medium	10.9	30.1	5.6
large	1.4	10.8	15.2

Source : Agricultural Census, 1985 - 86.

RESTORATION OF THE COMMONS

Commons or Common Property Resources (CPRS) are a main source of basic amenities e.g. fuel, fodder, food, drinking water etc. to the community at large and specially benefits the poor, women and marginal sections to a very great extent. Grazing fields, village forests, orchards, trees, water bodies, other waste lands, degraded forests and so on are the type of resources kept and used by the communities as a whole. More than these needs, the socio-cultural needs e.g. play ground, mela padia, marketing space, meeting, bathing, defecation, harvesting etc. are being met from these commons.

The value and use of such common resources are not properly assessed and hence, rapid depletion and encroachment are making them either unproductive or privately owned and used. Detail analysis of these resources have been made in the CPR chapter. However, its importance was realised much earlier and to prevent its alienation, the Orissa Communal, Forest and Private Lands (Prohibition of Alienation) Act, 1948 was passed. Revenue waste lands and common lands are encroached by influential persons in the villages and regularised in connivance with the revenue

Over-grazing need to be regulated.



Pix : Ghani Zaman for CPSW.

officials. This is a very dangerous trend and needs immediate attention. Grazing lands, village forest lands and orchards need to be restored, well developed with grass and fodder cultivation and managed communally. These would help to meet the food and fuel needs. Village tanks and water bodies are very crucial to store water and refill the ground water. Renovation of these water bodies through use of JRY, DPAP and other schemes can make a tremendous impact on the socio-economic and ecological life of people. With people's participation and political and bureaucratic support such efforts will succeed.

Livestock Development Self-Regulatory-Ecological Model : People-Herds-Pasture relationship is a complex one. For the individual pastoralist, the long-term aim must be to strike a balance between family and herd size so that the pasture maintains its capacity to feed the herd while the herd feeds the household. As migration becomes more attractive & secured, people decide to lend animals to relatives and go to the other areas for employment. This reduction in the households's labour force have very negative consequences for its herding organisation which cause both land degradation and encroachment of bushes. With greater access to labour, for example to separate milk from dry herds or to reach unpastured areas or to sub-divide herds into those designed for meat and those designed to milk production, or to keep different species, one should identify viable and non-viable combinations of the three components, people, herds and pasture. For this there could be different levels of sustainable combinations under identical ecological circumstances.

The individual herder devotes his attention primarily to the family herd, pastures being regarded as a collective asset, not managed by the individuals. The resource management of dry land herders is not at all an easy task. Because of such external circumstances as drought and disease, herd mortality rates are unpredictable and this creates a need to spread risks between households through various culturally specific principles for redistributing both people and livestock.Members of households which are no longer viable in terms of food production can move to more successful relatives or friends, who have a need for more labour or whose herds happen to be producing a surplus. To the extent that the local community still has access to animals, livestock can be re-allocated to households that have been hardest hit.

This spreading of risk to form a security system may be institutionalised at both an individual and a group level. An adult male strives to establish a geographically dispersed network of stock friends or associates. In this way he is insured against a local disaster by the possibility of borrowing individual animals from a different area. The payment and distribution of bride-wealth also provides institutionalised social bonds which can be used for the redistribution of livestock. Risk spreading amongst pastoralists in arid and semi-arid areas is thus a general principle of social behaviour which results in increased security for the individual.

FAIR PRICE TO THE FARMERS

Sri Jagadish Pradhan, a Social Worker who has worked for a long-period in West Orissa analyses the Kalahandi situation to be a complex phenomena. He says, "despite the high rainfall, amazingly high production of food grains, vast areas of good quality agricultural land, comparatively a lowly populated area and abundant natural resources, it is a fact that a vast number of the people of Kalahandi have been reeling under acute poverty. To him, among other things, pricing of agricultural products is the most determining factor of the drought situation. Therefore he calls the drought in Kalahandi a "Political Drought".

Increased yield in the command area of Hirakud Dam put paddy growers in rainfed areas to stiff competition from paddy growers in irrigated areas. This also ruined the economic condition of farmers in non-irrigated areas of Sambalpur, Bolangir and Sundergarh districts. Fall in the purchasing power of local people, fall in the demand for paddy from Kalahandi and non-remunerative prices for paddy in Kalahandi not only discourages, but forces farmers to stop cultivation.

Supply of food-grain relief from outside (including F.F.W. programme of C.R.S., CARE, CASA and L.W.S.) has discouraged growth of local food production, further reducing the demand of local food produce. All such free distribution of food and import from outside be stopped.

The Government support prices for paddy is not remunerative for the farmers in rainfed areas. In 1982-83 the support prices for paddy (common/per Q.) was Rs.122/- which was not adequate at all. During the period 1982-1992 the cost of production went up by 4-5 times and hence in 1992 the support price of paddy should be at least Rs.450/- per quintal. But Government has fixed it at Rs.280/- ! Moreover during November - January, 1992 in Kalahandi (also in many other pockets of Orissa) the actual price of paddy was between Rs.180 and Rs.220 per quintal. This has been pauperizing the farmers and leading the entire population into the grip of poverty. The traders and money lenders in Kalahandi - who also control the political power and the bureaucracy, have been flourishing while the local farmers are sinking in poverty. Of course, these sections invite droughts as well as more money in form of relief all of which ultimately benefits them.



Pix : Jagadish Pradhan.

Food grain import is a blow to local farmers.

PROMOTION OF OFF FARM & ARTISANAL OCCUPATIONS

Employment in this sector is an important aspect in any area. As per the Census records of 1961 there were 10172 Household Industries of 46 kinds which used to employ 26803 persons. Out of this 46% were women. In other activities like manufacturing other than household industry, trade and commerce transport, construction, mining and quarrying etc. 65536 persons were employed. Thus household industries and other off farm activities employ 9.14% of the population who are mostly landless.

During 1961 to 1989-90 there has been a dramatic fall in the employment in the off farm activities. Most of the household industries are almost extinct in the district. In the name of industrialisation a few small scale industries were started directly affecting the household industries. Small rice haulers have displaced paddy dehusking using 'Dhenki', while the oil expellers have displaced the 'Tel Ghanees'. Mill clothes have closed down the handlooms which numbered 3648 in 1961. As per the Government statistics of 1989-90 small scale industries, mining and quarrying in the district employed only 12087 persons. This sort of negligence towards the off farm activities in the district is also a major reason for the growth of rural unemployment and poverty in the district.

Weaving is a traditional occupation of lakhs of people in West Orissa. How are they going to survive ?



Pix : Sanjay K. Khatua.

Normally culture manifests itself through its manifold compartments. One of them is handicrafts. In Kalahandi potentialities though plenty, the meagre patronage does not inspire the growth of traditional handicrafts in the district. Kusum trees are found in plenty in Jaipatna areas. The area is believed to be one of the highest concentration of Kusum trees in India. These Kusum trees nourishes the growth of *lac production like tut trees* for sericulture. Therefore lac is plentily available in this area. During the pre-independence era, people used to make art objects in lac. It is even said that, the Jaipatna Zamindari was managed only with revenue from lac and lac made items. This practice is now extinct. Encouragement of lac works could provide money with employment.

The once popular horn works of Lanjigarh is now limping for survival. The main reason for its failure is inadequate marketing. The Praharias of Sunabeda Plateau are master craftsman in bamboo made items. The baskets, door screen, waste paper basket made by them are really superb. Likewise the Kondhas of Gunduri areas are basket makers working in bamboo which is split and woven into mats and baskets. These handicrafts ought to be supported.

Mat weaving and broom making is prevalent in Manikera and Mohangiri area and they prepare beautiful decorative mats. The raw materials are easily available in the forests of Kalahandi. There is no dearth of palm trees in Kalahandi district, but here people do not know how to make hand fans, chatta and other materials. Similarly the stream of larger



Landless poor in drought prone areas depend on artisanal works which are severely affected due to environmental degradation

grasses, locally called as Talanga and Kaincha are available in plenty, out of which many beautiful mats can be prepared. If properly harnessed many could earn their livelihood. The potteries of Junagarh area, particularly the well designed earthen lamps are worthy to be praised. Among the handicrafts of Kalahandi, the most attractive are the wooden art objects of Khairpadar. Many feel it privileged to adorn their houses with these art objects. Even some of these pieces have been exported to Japan. The stone sculptures of Ampani are wonderful. The art objects prepared by the Debgunia community with paddy is a special art rarely found elsewhere. The images of Laxmi, Jagannath, Balabhadra and Subhadra made of paddy are worshipped by the local people during the month of Margasira, so for all these handicrafts, proper training be given by inviting experts in the field and, a show room at the district head quarter may be opened to acquaint the tourists and other interested people regarding these objects. They may also be sponsored to different trade fares and handicraft workshops.

Rope making is an excellent off farm work being undertaken by all the villagers of Barpadar near Khariar and few other villages. Earlier, they were purchasing raw materials which was collected by others from forests of Kantabanji, Patnagarh, Tureikela, Bangamunda etc. This was providing employment to the collectors too. The scarcity of raw material affects heavily by the rope makers. The rope of these village has a good market potential in Raipur, Nagpur, Dung, Vilai etc. to which places, they travel to sell the rope products.

LITERACY & POLITICAL LITERACY

Kalahandi has the lowest literacy rate of 19.5% while rural literacy is 17.6% and female literacy shamefully 7.68% next only to Koraput. The 1991 census reveals that 11,88,958 out of 15,91,954 are illiterates. The small rise in percentage of literacy is no solace as nearly 12 lakhs continue to call themselves 'Murukh' - a epithet as denigrating as calling oneself Chandal. This voluntary introduction as 'Murukh' by the local people is an invitation to the elite and vested interests for unbridled denigrations that are meekly accepted.

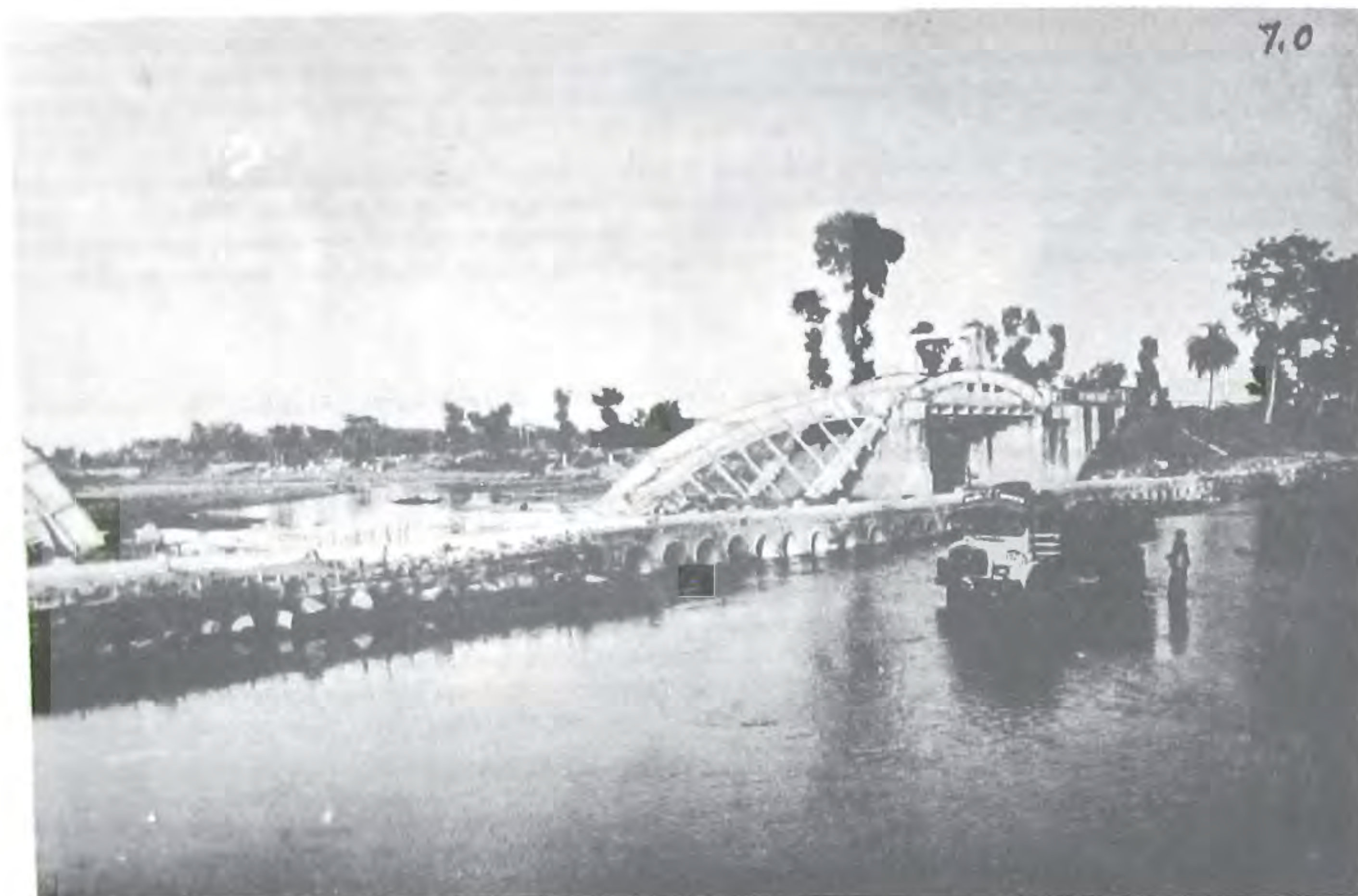
Sri Achyut Das analysing the poverty of Kalahandi says that in every development concept and practice, the poor who is the beneficiary supposedly remains completely in dark. He is hardly aware of the programmes meant to develop them. He criticises the easy answer thrown to Kalahandi's poverty as low literacy and lack of awareness. He says that literacy drive has a meaning but has limited expression. Awareness always remains undefined in socio-political context. In Kalahandi, what is needed is political literacy just not literacy. It is unfortunate that Kalahandi district is excluded from the special south Orissa Education Project being proposed with foreign collaboration even though this special project was originally conceived with primary focus on the problems of *Kalahandi.*

PEOPLE'S ORGANISATION ON MICRO-WATERSHED BASIS

Kalahandi typifies the situation of poverty and destitution. Lack of capital marketing and infrastructure on the one hand and deprivation of a majority of the population from resources like land, water, and forests has caused an enormous calamity which is primarily a human failure, says Prof.Manoranjan Mohanty of Delhi University. His answer to that is people's organization (Lok Samiti) for self development. In tackling the extreme problems of Kalahandi we are likely to find the key to ratifying Orissa's under development and also be able to reorient India's path of inequitous development. Then, Kalahandi would have become a symbol of struggle for a great regeneration.

The present form of gram panchayats are units too large for people to participate in the political process. Sri A.V.Swami says, Grampanchayats should assume the character of a federal body of different autonomous villages deciding their own priorities. A micro watershed should form the unit of development for planning and implementation instead of a gram panchayat for maximization of resources utilisation in an integrated way. All decisions related to schemes like JRY made at village level, should be mandatory by law. Also at present the "Village Development Committees" formed by Block officials are dominated by class and caste factors. As long as these equations at different levels of decision making remain unchanged, the state of the poor, and oppressed won't change.

Flash flood of Ganjam in 1990 resulting in collapse of the bridge.



Pix : Ghani Zaman for CPSW.

FLOODS

Floods in India are synonymous with a host of untold human misery, suffering and woe. Floods make a mockery of human designs to contain it, throwing aside the concerns of engineers, planners, administrators and environmentalists, causing enormous loss of life and property and draining out the state's exchequer.

As the most flood affected country in the world after Bangladesh, India accounts for one fifth of the global deaths due to floods and incurs a loss of Rs.2,307 crores annually. And in recent years the intensity as well as the frequency of these floods have been dangerously increasing.

FLOODS AND CYCLONES IN ORISSA

Orissa is no exception to this phenomenon. Along with Utter Pradesh, Bihar, West Bengal and Assam, it stands as one of the most flood prone states of India. Its four major rivers, namely, the Mahanadi, Brahmani, Baitarani and Subarnarekha flood a total area of 24 million hectares.

With a coastline that borders the Bay of Bengal, Orissa is also prey to a wide variety of storms and cyclones, that rip the land apart, causing untold misery and death and widespread destruction of property.

But the real tragedy is, that man's interference with nature, plays a major role in triggering of the phenomenon. For as the environment is degraded, nature goes wild and expresses its fury unabated.

To understand this, we must study the river system of Orissa and its contribution to inviting nature's wrath.

TABLE - 1 : Flood Affected Area Statewise (1953-84) (in mha)

Flood Affected area (mha)																	
State/Years	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Total
India	9.54	8.45	13.25	5.72	13.72	6.7	6.15	17.89	17.43	18.61	3.98	17.08	6.46	28.11	15.98	15.22	239.8425
Andhra Pradesh	1.45	0.16	N.A.	0.05	N.A.	0.004	0.004	1.0	5.98	0.49	0.07	0.06	0.003	0.04	2.53	3.22	17 211
Assam	0.81	0.72	0.36	1.10	2.75	0.12	0.01	0.57	1.10	0.31	0.67	1.16	0.46	Neg	0.73	1.52	28.6
Bihar	0.97	0.93	4.26	0.22	0.73	3.14	0.31	2.99	1.15	2.37	0.81	1.92	1.26	0.93	1.47	2.64	45.4
Orissa	0.65	0.32	0.61	2.97	1.34	0.19	0.51	Neg	0.31	0.41	0.30	0.36	0.09	0.0	0.22	0.7	23.59
West Bengal	0.53	2.01	0.26	0.44	0.87	0.38	0.2	1.3	1.55	3.08	0.02	0.38	0.38	0.21	0.38	1.73	23.59

Source : Centre For Science and Environment (1991) State of India's Environment : A Citizens' Report.

ORISSA'S FLOOD ACCOUNT

During the last one and half century Orissa has had 17 major floods, causing extensive damage through loss of livestock, human life and property, as well as inundation of agricultural lands, siltation, water logging, salt water intrusion and tidal inundation.

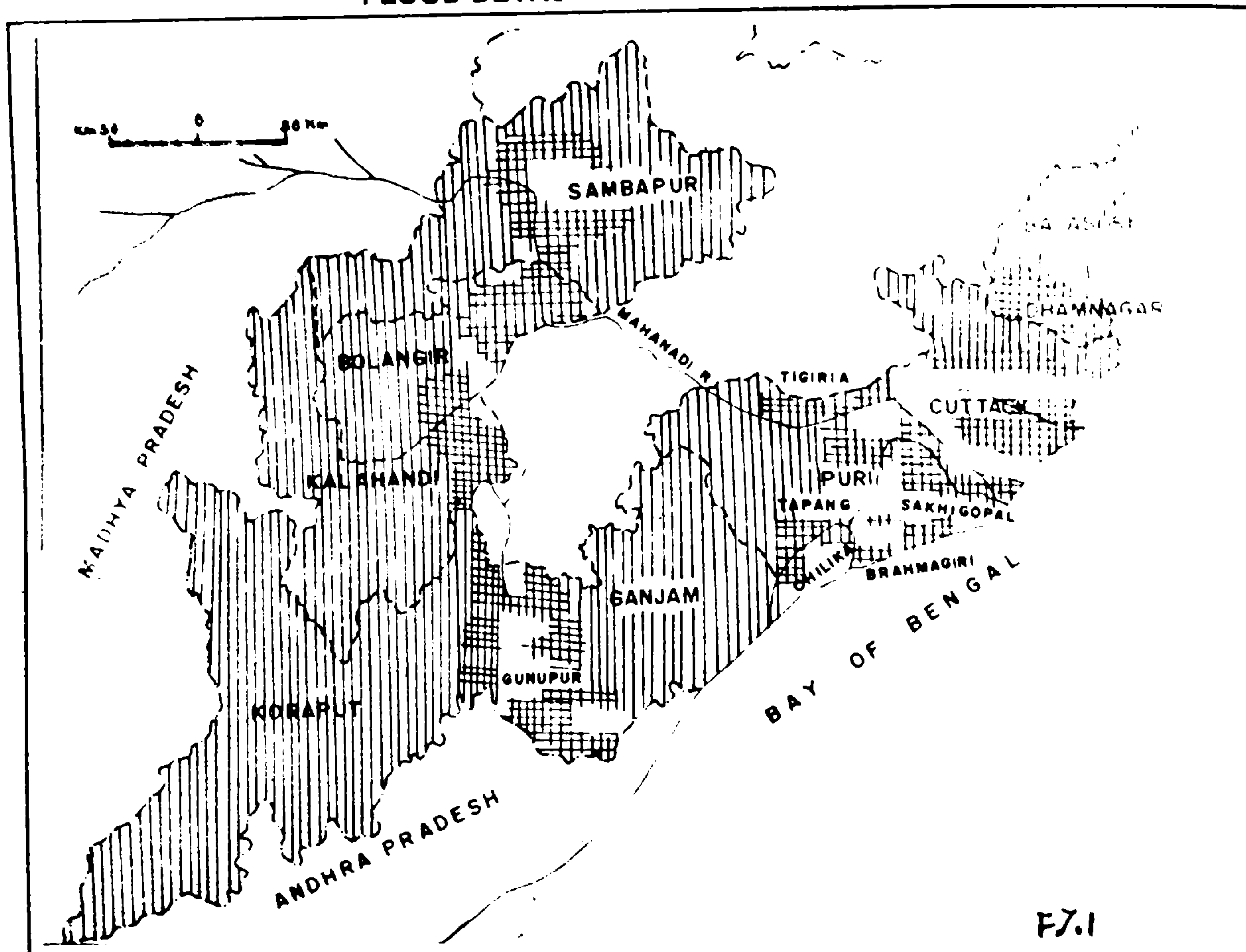
Table - 2 : Flood at A Glance

YEAR	IMPACT
1834	First recorded flood. Insufficient data.2/3 of houses in flood area destroyed.
July 1855	The worst flood of the 19th Century. Affected area-Cuttack district. Discharge - 1.8 lakh cusecs of Mahanadi Breaches - 1360, Velocity - 7 ft.
Aug.1886	Breaches - 478, Crop loss - 2,60,00 tonnes of rice
July 1896	Longest flood ,water level at Mahanadi stood above danger level of 88 ft.for 15 days
Aug.1926	Affected area-700 sq.kms of Cuttack,Puri & Balasore district,Population affected - 3,50,000 lakhs
1933	Property loss - 3919 houses washed away, 7565 damaged, 2759 acres sandcasted
1937	Breaches - 37, Property loss - 3378 houses damaged, Deaths - 144 heads of cattle lost
1955	Breaches-169, Property loss-2600, Houses washed away-52000, Damaged-56000, Deaths - 59 human lives, 259 livestock, Population affected - 13.56 lakhs, Sandcasting - 11651 acres.
1975	Property loss - 18,376 house collapsed, 68,000 damaged,Death - 32 human lives, 900 - livestock, Population affected - 14 lakhs
Aug/Sept.1977	Breaches - innumerable, Property loss - 1800 houses, 150 - Schools, Population affected - 10 lakhs
Aug. 1979	Sandcasting - 532 acres, Property loss - 3.50 lakh hectares of crop, 4,800 houses collapsed, 1,500 houses damaged, 341 schools & 85 other building damaged.
Sept.16-18,1980	Deaths - 5 human lives, 1176 goats & sheep, 506 cows and bullock, 1157 other livestock. Property loss - 5,15,748 hectares of crop, Population affected - 29 million in 10 districts.

Table - 3 : Floods In Cuttack District

PERIOD	FLOOD YEARS	ASSESSMENT
1800-1850	1834,45,46,48	200 breaches(approx.in each in cidence of flood.Drought followed in the year 1836,37, & 42.
1851-1900	1851,52,53,54,55, 56,57,62,66,68,72, 74,77,79,80,81,85, 90,92,93,94,95,96 and 1900	23 floods in 50 years. More than 1000 breaches 1855 was the severest flood of the century
1901-1930	1907,08,11,13,20, 26,27,29,1930	1926 was the severest, 15 lakhs affected, 60 acres of crop dam aged. 3000 houses swept away.
1931-1960	1933,37,39,43,44, 47,55 and 1956	—
1961-1992	1961,62,72,73,74, 75,77,78,79,80,82, 83,84,85,86,90,91& 1992	1982, the Worst in the history of floods in Orissa.

FLOOD DEVASTATED AREA OF ORISSA



Source : OSPCB, Bhubaneswar.

In 1990, flood waters of Luna, Chitrotpala and Karandia ravaged the Marshaghai, Garadpur & Mahakalapara blocks of Cuttack district, four successive times within 3-months, 2 lakh people were victimized by these flood waters. Patkura was affected thrice on 25th August, 9th and 18th September while Ali block was even more severely tested as floods hit it an unbelievable 13-times between February and October destroying 21,000 acres of land.

The Bhogarai, Baliapal, Basta and Jaleswar blocks of Balasore district were flooded twice within a space of few months by the Jalaka and Subarnarekha rivers, affecting 50,000 people. Nilagiri and Bhadrak sub-divisions also experienced floods twice this year, causing inconvenience to 3 lakhs. In Puri district, the Rajua river surprisingly flooded the Brajamohanpur block 5 times. The Tel and Hati rivers were not to be left behind, inundating the Dharmgarh and Junagarh blocks of the Kalahandi district thrice within two months. Thus 1990 was a year of as many as twenty eight floods, affecting the districts of Cuttack, Puri, Balasore and Kalahandi.

1991 was not such a conspicuous flood year. Yet the Devi, Prachi and Kushabhadra followed a similar pattern of flood frequency of the last year and flooded the Kanas,Kakatpur, Astaranga, Gopa and Nimapara blocks of Puri districts, twice this year ;affecting 200 villages.

1992 saw some more floods in the Cuttack and Puri district. Within 20 days of the first flood another flood hit Naugaon, Balikuda, Tirtol, Biridi, Raghunathpur, affecting 66,549 people in 136 villages. In Puri district, heavy floods in Banki and Damapara, Gopa and Kakatpur blocks followed a similar pattern as that of 1991. Though these are low floods, occurring frequently, the return period save so minute that they cause cumulative and extensive damage.

Repeated Floods in 1994 : 1994 experienced peculiar flood situation in Orissa. Early monsoon breakout caused floods unexpectedly and this was repeated to the extent of six-times in some places till mid of August. Serious floods was experienced in Subarnarekha and Mahanadi. As many as six-times in Subarnarekha and 3-times in Mahanadi were quite disastrous. The intensity of the floods was quite high 'and flood waters continued to stay for longer durations. Subsequent floods in Mahanadi became serious mainly due to release of excess of water from Hirakud Reservoir. The whole of coastal Orissa was badly affected, with Jagatsinghpur district and North Balasore the worst hit areas.

In just half way of the monsoon season, Subarnarekha river experienced floods six-times consecutively. South-west monsoon season is in the mid of August, and the North-east monsoon season is still there. Almost one and half lakh people of four coastal blocks of Jaleswar, Basta, Baliapal and Bhogarai are fighting with floods to survive. Approximately 70,000 acre crop lands are washed away and a thousands of houses are collapsed after remaining in water for long-duration. In north Balasore, 44 breaches have created a havoc and this is the case in many other parts of the state.

WHEN THE GODS WENT CRAZY

1982 was perhaps the most woeful of all years in the history of Natural calamities in Orissa. Ravaged by the cyclone of 3rd & 4th June, followed by an unprecedented drought in July, Orissa was caught unawares and unprepared when floods hit the entire State from 29th August to 1st September.

Having hardly recovered from the preceding natural calamities, the flood multiplied the loss, making the year to be ill-remembered as one of the most devastating flood years in the history of Orissa.

So severe was the flood that it affected even districts like Sambalpur, Bolangir, Phulbani and Dhenkanal which are not conventional flood prone areas, being situated in the upper basin of the Mahanadi. Moreover, rivers like Prachi,Alaka and Renuka which had been silted for hundred of years opened up, extending the area of the floods.

DAMAGES

DISTRICTS AFFECTED	8
BLOCKS AFFECTED	144
VILLAGES AFFECTED	9289
POPULATION AFFECTED	54 Lakhs
HUMAN CAUSALITY	127
CATTLE AND ANIMAL LOST	26359
PRINCIPAL CROPS DAMAGED	Paddy, Pulses, Jute & Oilseeds
CROPPED AFFECTED	12 lakh hectares
SAND CASTED AREA	75000 hectares
HOUSES AFFECTED	4 lakhs over 26,500 hectares

FLOODS & CYCLONES OF 1990 : GANJAM THE WORST AFFECTED

In 1990, Orissa was visited by cyclone and flood. The year started with unusual rains from the month of February. Another disturbing feature this year was the occurrence of hail storm accompanied by cyclonic wind in several parts of the state, particularly in the hilly and plateau regions. Hail storm accompanied by cyclonic wind lashed parts of Dhenkanal, Puri, Balasore, Sambalpur, Kalahandi, Cuttack and Sundergarh districts during second fortnight of March and first fortnight of April, 1990. Heavy rains lashed Ganjam and Koraput from 10th-12h May, 1990 following the cyclone which hit Andhra Pradesh on 9th May. 2577 villages in 28 blocks in Ganjam district and 14 Urban Local Bodies with a total population of 3.61 lakhs were affected.

Table - 4 : Preliminary Estimate of Damages

1) No. of Blocks affected	17
2) No. of N.A.Cs affected	9
3) No. of villages affected	753
4) Population affected	6.4 lacs
5) Casualty human	58 - mission 13
6) Crop damaged	80,000 hect.
7) No.of houses damaged (tentative) washed away/fully/partly collapsed	70,000
8) Sand cast (tentative)	20,000 ha
9) i) Cattle casualty (tentative)	10,100
ii) Goats & pigs casualty	10,200
iii) Poultry (tentative)	7,500

Extremely intense precipitation occurred in the districts of Ganjam, Puri and Koraput from the 2nd November (1800 hrs) to 5th November (0800 hrs) consequent upon a deep depression that concentrated in the Bay of Bengal on the 31st October of the Tamilnadu coast and moved in a north-northwest direction until it crossed the Orissa coast at Gopalpur on the 3rd November 1990. the deep depression remained stationary over Ganjam for almost 36 to 48 hours and the most intense rainfall occurred over a spell of 30 to 36 hours only commencing from the evening of the 2nd November.

The entire Rushikulya basin covering 3,455 sq.miles of drainage area received 250 to 500 mm of rainfall. The area under Rushikulya river upto Hinjili covering 1,000 sq.miles received the more intense rain averaging 400 mm by 8.00 A.M. on 4th November and the balance drainage area of 2455 sq.miles received 250 to 300 mm.

Flood Intensity : The consequence of such catastrophic precipitation was the occurrence of a flood of unprecedented magnitude of approximately 3,00,000 cusecs in the Rushikulya river at Aska (at the confluence of the two major tributaries, Rushikulya and Badanadi).

The outflow from the three reservoirs at Sorada Bhanjanagar and Daha would have contributed (considering staggering of the flow) a maximum of 40,000 to 50,000 cusecs to the flood flow of 3,90,000 cusecs in Rushikulya at Aska, whereas Ghodahado and Dhanei reservoir contribution would have been 30,000 cusecs at Hinjili (confluence to Rushikulya) out of 1,00,000 cusecs. As these reservoirs are ungated, any reduction to the flood flow by operation to moderate the flood would not have been possible. There was a overall flood peak of 5,50,000 cusecs that was generated from the entire basin, causing havoc in Ganjam district.

Lakhs of flood victims were tragically living in an uncertain future. Consequently the climatic change in the state and frequent rains caused a serious threat to life of the victims and diseases like cholera, diarrhea, cold and bronchitis broke out in the area. The state government, had of course taken immediate action for distribution of emergency relief but due to the lack of communication, adequate relief did not reach the victims. Voluntary organizations had played a challenging role in rescue and distribution of relief in shape of food stuff, temporary shelter, medicines and clothes and emergency relief. In spite of all rehabilitation measures the flood left a deep mark in minds of the people.

A flood scene in Orissa.



Pix : Jagadish Pradhan.

Table - 5 : Flood Damage in Orissa, 1967-1986

Year	Total area affected by flood (sq.kms)	Cultivated area affected by flood (sq.kms)	Area of sand casting (sq.kms)	Area of water logging (sw.kms)	Population affected by flood (lakh)	Houses damaged (Nos.)	Death of human life (Nos.)	Death of cattle & other animals(Nos.)	Crop loss (lakh Rs.)	Loss of property (Lakh Rs.)
1967	7,512	2,692	NA	NA	19.66	105,365	327	10,249	110.99	NA
1968	7,156	1,788	6.8	724	14.28	175,404	78	22,285	NA	533.44
1969	6,440	2,744	128.0	1,716	23.70	50,113	25	1,517	53.24	650.00
1970	3,708	3,188	48.0	1,872	19.43	13,265	8	29	9.00	11.69
1971	6,004	4,688	NA	NA	22.82	95,043	26	265	1,213.46	2,093.00
1972	3,644	3,644	52.0	1,472	17.38	18,754	8	3,506	93.77	418.90
1973	13,264	5,844	NA	NA	43.34	NA	NA	NA	2,403.01	NA
1974	1,512	1,160	6.4	544	14.63	14,734	9	30	19.63	NA
1975	7,984	4,192	156.0	1,384	31.41	144,153	74	4,996	456.24	358.00
1976	440	160	NA	NA	2.54	2,448	8	68	112.56	NA
1977	-									
1978'	3,578	2,508	NA	NA	26.01	19,965	21	262	864.93	1,293.95
1979	7,179	4,594	NA	NA	15.58	1,939	15	85	49.72	523.10
1980	5,157	3,197	68.65	NA	29.14	130,981	82	16,669	3,649.75	4,554.77
1981	873	303	NA	NA	NA	1,724	15	177	NA	877.58
1982	33,790	7,270	NA	NA	63.08	431.760	128	36,183	10,590.12	21,474.93
1983	2,510	1,161	NA	NA	10.87	5,281	16	835	313.59	630.77
1984	NA	5,960	NA	NA	35.41	22,754	28	NA	NA	NA
1985	9,620	8,890	NA	NA	112.70	176,162	91	7,991	6,366.31	14,497.36
1986	6,114	3,384	NA	NA	60.99	97,902	29	823	1,756.44	12,694.33

FLOOD PRONE AREAS

Where river systems exist, floods are an inevitable consequence. As much as they provide fertile plains that are increasingly inhabited for cultivation, rivers also have in them the capacity to destroy these civilizations. Thus floods not only inundate a large part of the land but they also cause damage to crops, property, livestock and human lives.

In Orissa, floods partially submerge or drown about 24 million hectares of land, which constitutes 15 per cent of the total geographical area of the state.

Flood Zones : In the sub-montane tract and upper fluvial plains, of the Orissa Coastal Plain, the flood hazards used to occur in the form of river spilling through breach of the embankments. But, however, the intensity and duration of flood damage is minimum. In the middle fluvial plains and meandering and braided streams, ox-bow lakes, cut-offs and high level escapes which allow the flood water to enter into the intefluves and even affects the protected irrigated tracts. Hence the magnitude of the damage here is relatively high than that of the former. In the lower fluvial plains, where the fluvial and marine processes are active, the flooding is not only the spilling of flood water but also it develops water logging besides the tidal flooding. The magnitude of the flood damage is relatively very high in this part and the problem is a recurrent phenomena for the people of this region even in the years of normal rainfall.

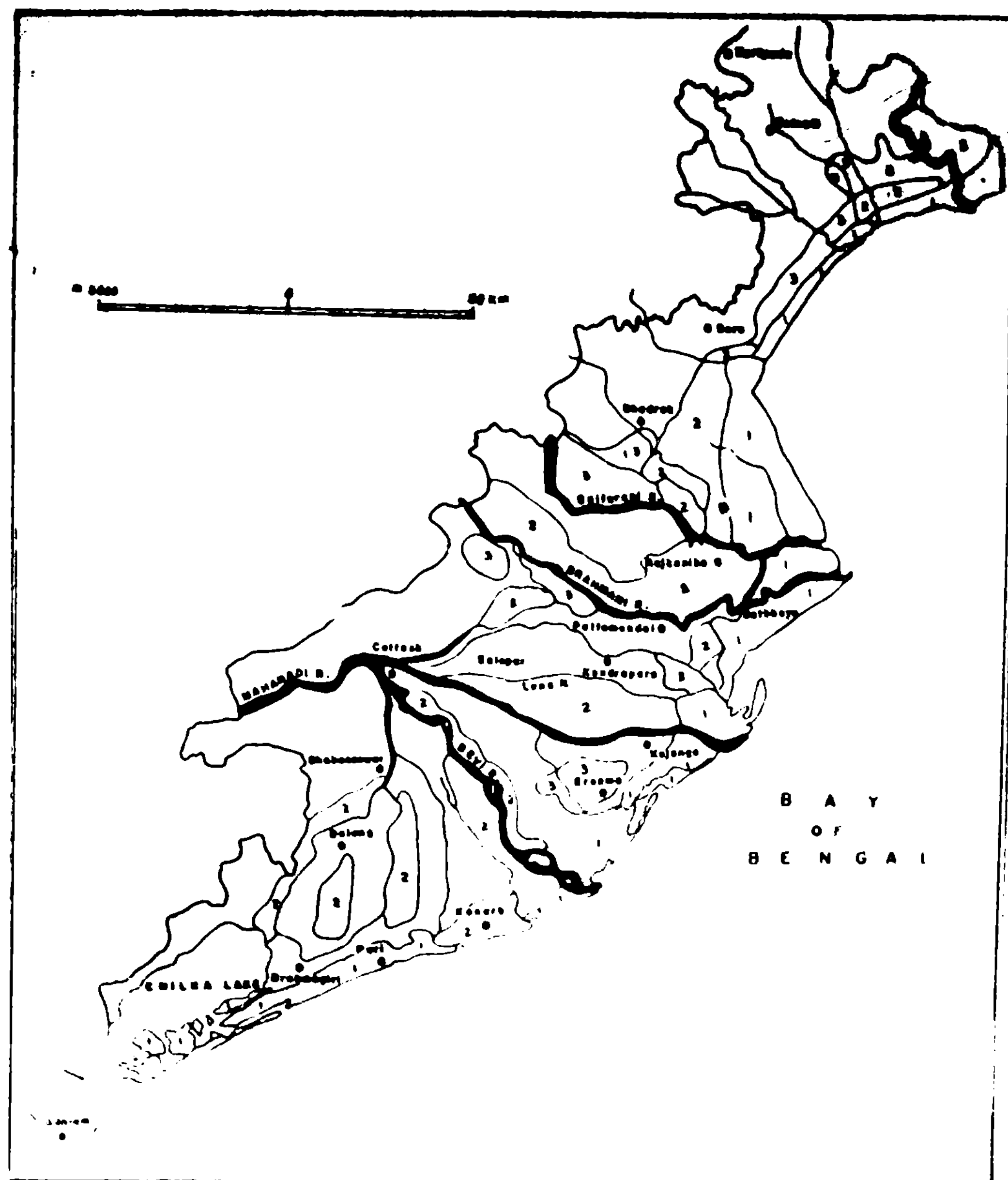
Areas close to the sea and on the deltaic plains are most vulnerable to floods. Thus the coastal districts, Cuttack, Puri and Balasore are relatively much more prone to floods. Cuttack district alone, among all the other coastal districts, bears the brunt of floods in Orissa.

Cuttack District : Spread over the district like veins in the human body, the river Mahanadi, Kathojodi, Brahmani, Kharasuana, Luna, Chitrotpala and several other small distributaries make Cuttack the most flood prone district of Orissa in spite of many flood protection works in the district.

Jagatsinghpur is a case in point. A flood protected area, Jagatsinghpur has had bunds on most of its rivers. Yet these were of no avail during the heavy floods of 1980 and 1982. Breaches in the famous Dalcighai resulted in extensive damage throughout the subdivision, especially in Balikuda, Ersoma and Kujang blocks. Moreover, these areas are cyclone prone, as was proved during the 1982 cyclone which caused floods.

Kendrapara which is traversed by Mahanadi, Brahmani, Baitarani and its tributaries like the Luna, Hansua, Ranahansua, Chitrotpala, Kharsuan, Kani and Paika is similarly devastated by floods and cyclones annually. All its coastal blocks, namely Rajnagar, Mahakalpada, Marshaghai & Rajkanika have repeatedly faced floods and cyclones. Thus Cuttack district is doubly up against natural calamities constituting an area that is almost alwayaffected by floods and cyclones.

ORISSA COASTAL PLAIN - FLOOD PRONE AREAS



Source : B.N.Sinha, Geography of Orissa.

HISTORY OF FLOOD CONTROL

Cuttack, the ancient city in Orissa which recently completed its 1000 years of foundation, has a long history of flood ravage. It is situated on the bank of Mahanadi and is surrounded by water in 3-sides. The reason for its location was essential from communication point of view, the city being an important business centre. A number of ponds were excavated in the city to absorb water. However, people liked to live in Cuttack and live with floods. A hundred years before, the famous man known as the savior of Cuttack was "Baimundi" who collected money from the people and presented to the then king Cuttack to construct a ring bund arround the city. And, the present time "Baimundi was the P.W.D. Minister in the Congress cabinet in 1980s who constructed a pucca and high ring road around cuttack. However, the flood situation is more serious in Cuttack now that is was earlier.

Embankments built centuries ago, along the rivers of the Indo-Gangetic plain in the north and along Godavari, Krishna and Kavery in the South, bear mute testimony to the long and ancient heritage of flood technology in India. This practice was obviously linked to the economic prosperity of a place and therefor construction and maintenance of flood works was patronized by kings and zamindars. Though records of all such flood protection works are not available, it is inferred from the data available that flood protection in terms of embankments, was an established practice in the traditional flood prone states of Bengal, Bihar, Orissa and Andhra Pradesh.

When the British left India, there were some 5,280 kms of embankments along various rivers of which 1,209 km were along the Mahanadi, 287 along the Brahmani and 160 kms along the Baitarani in Orissa. Though the colonial rulers envisaged flood control and set up committees at several intervals to study and implement flood control measures, scant attention was paid to the recommendations of these committees. It is only in the Post-Independence era, that nationwide flood protection programmes were planned.

The history of flood control in Orissa is as old as that of India and has gained significance in the post independence period. Several high level committees appointed, both by the Centre and the State, have studied the situation and drawn comprehensive programmes and polices for flood control in the State.

A high level committee appointed by the Centre in 1957, suggested construction of non-returnable sluices in the flood embankments, drains for depressions in protected areas, distribution work at bifurcation points and construction of dams on the Brahmani, and Baitarani, which is to be supplemented by embankments along these rivers.

T.2

The committee also reviewed embankments and recommended that in its middle reaches, drainage congestion is to be cleared. It also stated that in deltaic areas where river channels are higher and irrigated lands saucer shaped, measures should be taken towards spill prevention and improved drainage, change in crop variety and practice, utilisation of ground water (so that the water table is lowered) and a ban on construction of seasonal bund obstructions.

INCREASING FLOOD FREQUENCY

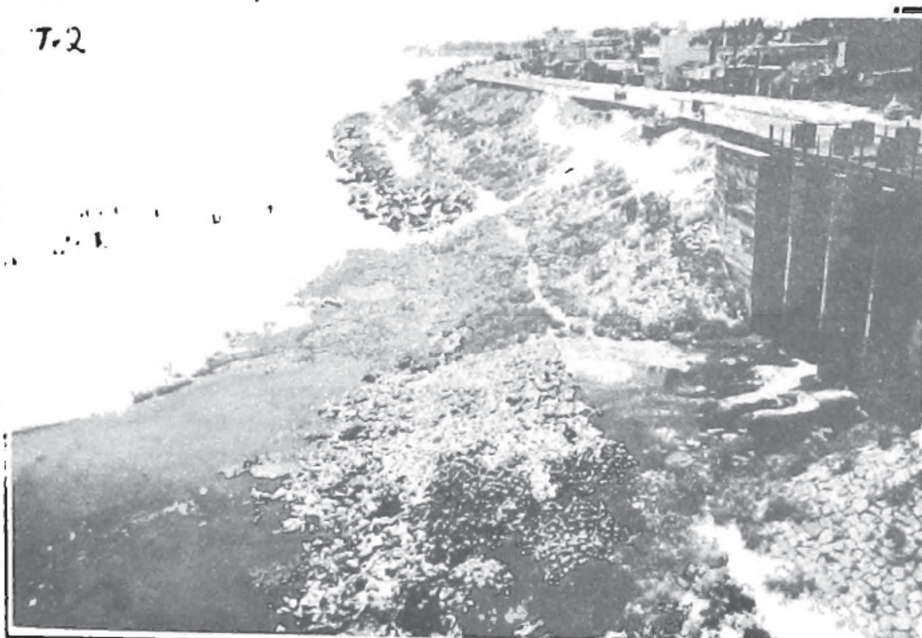
From available sources that cover a wide period from 1834 to 1982 it is seen that the average periodicity of the floods has been steadily shrinking over the last one and half century in Orissa. The frequency and seasonality of flood occurance has been analysed by G.K.Panda & B.N.Sinha.

1834 saw the worst ever recorded floods of the nineteenth century. Between 1834 and 1926 there were six major floods with an average interval of 3.86 years. Obviously, prevention in terms of Water Management after the Nanka famine of 1856-66 succeeded in mitigating the shrinking periodicity upto the seventies of the last century. But by the 1930s, its impact petered out and the long run forces of ecological erosion had taken over with shrinking periodicities of floods between 1926 and 1955, when another means of major interventions, through big dam technology and traditional flood jacketing started in Orissa.

In recent years, floods twice, thrice or even 13 times in a single year, are becoming an increasingly common phenomenon defying the very concept of flood intervals. Between three years (1990-94), the coastal districts of Cuttack, Puri & Balasore were affected by floods several times in a single year.

Table - 6 : Flood Years & Intervals in Orissa (1834 TO 1990)

Years	Intervals (in years)	Years	Intervals (in years)	Years	Intervals (in years)
1834	—	1940	3	1980	5
1855	21	1955	15	1982	2
1866	11	1961	6	1985	3
1872	6	1970	9	1990	8
1896	7	1972	2	1991	1
1926	30	1973	1	1992	1
1933	7	1975	2	1994	2
1937	4				



Pix : Ghani Zaman for CPSW.

Ring road around Cuttack city - does it protect the city from floods?

MAHANADI : THE SORROW OF ORISSA

After the great flood of 1855 the Company Government engaged Capt. Harris, an English Engineer to study the flood problems of Mahanadi and suggest protective measures.

Capt. Harris, estimated the 1855 flood at 15,13,275 cusec and he calculated that the Kathajori system and Mahanadi system shared the flood discharge at the proportion of 0.802 to 1.00. He also observed that Mahanadi was not taking its due share and that the Kathajori head was widening alarmingly for which he suggested and constructed the Naraj Spur (later converted to Naraj Anicut), so that the flood proportion would atleast be maintained.

The spur was latter made over to East India Canal Company in 1863 who built the Naraj weir with a view to permanently regulating flood waters in a proportion of 3:5 (Kathajori-Mahanadi). The weirs across Mahanadi, Birupa & Kathajori were thus designed for following flood discharges.

(a)	Mahanadi Weir	- 8,62,093 Cusec
(b)	Birupa Weir	- 2,66,250 Cusec
(c)	Naraj Weir	- 6,75,000 Cusec
	Total	**18,03,343 Cusec**

In 1872 there was a high flood of 14,87,547 Cusecs in Mahanadi and the distribution in Kathajori and Mahanadi system was 1.01, to 1.00. The Superintending Engineer, of Orissa Circle, Mr.R.H.Rhind said. "It would therefore appear that at the time when the great flood of 1855 occurred, the discharges of the Kathajori and Mahanadi were to one another 0.802 to 1.0 instead of 1.01 to 1 as has been the case during 1872.

Mr. Odling, the Chief Engineer, Bengal observed" The serious deterioration in the carrying capacity of the river Mahanadi must have occurred between 1855 and 1864 when Naraj weir was approaching completion and shows how serious the evil it has arrested".

The 'Mahanadi' which was a pride of our State has now very sadly turned into the "Sorrow of Orissa". A look at the staggering figures shows the fate of Orissa.

Table - 7 : Flood Damage in Pre & Post Hirakud Dam

Year	Population affected	Breaches	Cultivated area rendered useless	Area sand cast	Live stock	Lives lost	Jobra Ghat	Hariha
1955 (Pre-Dam)	1976602	832 P.W.D. 247 Revenue Embankments.	988570 acres	20,600 acres	760	579	76'-2"	27'-8"
1982 (Post-Dam)	5000000	500	28.8 lakh acres	—	—	176	77'-6"	29'-0"

Post Hirakud Dam : It was pointed out by the Advisory Committee of the Hirakud Dam Project - June 1948, M/S Savage Narasinghamaya and Gadkery that floods in the Mahanadi will cause permanent anxiety as the embankments and canal system proposed by the Delta Irrigation Project affects the flood plain of the Mahanadi delta. It was opined that the present condition of the Mahanadi and its branch rivers can safely discharge a peak flood of about 10 lakh cusecs without causing any breahes. The moderation effect of Hirakud reservoir was not expected to be very effective due to the fact that the run off from the intermediate catchment of 18,000 sq. miles had no control against a controlled catchment of 32.000 sq. miles above Hirakud Dam & the situation of the reservoir was about 180 miles away from the head of the Mahanadi Delta.

From a glance at the map of Delta it will be seen how the flood plains have been encroached upon year by year and floods of moderate magnitude flow steadily for days together, and another flood in quick succession coupled with the phase of the moon, which keeps the sea level high, particularly during full and new moon days, causes damage and destruction. The problem was one of 12 lakh cusecs flowing for 3 hours and 10 lakh cusecs flowing for 3 days, a problem not anticipated before. In other words water accumulated in the lower reaches.

As per Prof. B.N.Sinha of Utkal University, the Hirakud Dam has stemmed low floods but not high ones, because the frequency of High flood has risen to once in 3.38 years from once in 3.48 years and that of low floods has fallen to once in 3.35 years from once in 3.10 years.

However, Sadhana Satpathy of the Centre for Development Studies presents a different picture of the frequency and intensity of floods in the pre-dam and post-dam periods. According to her, from 1951 to 1957, floods occurred in 78 per cent of the years as compared to 44 per cent from 1958-1984. The share of large and very large floods went down from 76 per cent to 42 per cent after the dam. The share of small and medium floods went up from 24 per cent to 58 per cent. The average intensity declined from 33,220 cumecs to 30,250 cumecs. So the dam has a positive impact. But, storage capacity of the Hirakud Reservoir is going down due to siltation. The dead storage level has come down to o.15 mham from 0.23 mham by 1981. And, the gross storage has been reduced to 0.66 mham from 0.81 mham at the beginning. In addition to this, filling of the whole reservoir in July for electricity generation purpose, leaves no space to accumulate excess main water towards end of August or September. Again, continuous and heavy rain fall in addition to excess release of water from the reservoir, creates flood havoc which would not have been the case in the absence of the dam. In 1994, early and continuous rains in June helped in filling the reservoir. Thereafter, consecutive floods were experienced in July and August, though the remaining period of the present monsoon season is yet to be over.

An analysis of flood frequency over the years (1956-1994) shows that it has increased from 11-8 years before the dam to 2.45 years after its construction.

Table - 8 : Recurrence of Floods in Mahanadi

Before Hirakud Dam		After Hirakud Dam	
19th Century			
1900-1955		1956-1994	
Year of flood	Recurrence year	Year of flood	Recurrence Year
1855	21	1961	5
1866	11	1970	9
1872	6	1972	2
1896	24	1973	1
1926	30	1975	2
1933	7	1980	5
1937	4	1982	2
1940	3	1986	4
1955	15	1990	4
		1991	1
		1992	1
		1994	2

The collection of rainfall from the catchment below the dam plays an important role in creating floods. Main tributaries Ong, Tel, Hati, etc. flow to mahanadi in the down stream catchment. Substantial deforestation in the catchment of these rivers has caused massive soil erosion and siltation of river-beds which result in quick run-off. Hence, this part is quite responsible for the causation of more number of floods in Mahanadi delta.

Duration of the floods cause greater impact in a normal year than the intensity of the flood. The extensive embankment system in Mahanadi Delta is causing more harm than the protection it is offering to the area. Drainage problem in connection to the tidal waves of the sea do not allow easy release of flood water. So, the flood damage manifolds. Hence, any effort to control floods in Mahanadi, can not take a single approach. It has to be a coordinated and integrated approach. Even, it is good to allow the flood waters to flow on fields and people live with floods, than investing thousands of crores of rupees and multiplying the problem.

Flood Control In Mahanadi : Since then years have passed and the problem has been further aggravated. The floods of 1961 (12.7) which till recently was the highest in living memory had a flood flow of 12 lakh. cusecs and the Kathajori-Mahanadi proportion was 1.03 to 1.00 and with a 15 lakh cusec flood on this data, distribution would have been in proportion of 1.20 to 1.00. Thus carrying capacity of Mahanadi further deterioted in these years and if distribution of the August flood of 1982 is calculated the problem may be of further interest. For flood protection of delta it embanked the rivers in canal areas, and improved drainage system.

It raised and strengthened the Cuttack city protective embankment of 28,000 ft. length with crest level 4' above the calculated high flood level (18 lakh cusecs). For flood moderation and perineal supply of water for irrigation and navigation right up to Calcutta, and Madras presidency in coast and Raipur district in upper Mahanadi it has investigated and planned extensive system of navigation canals and five reservoirs in upper Mahanadi catchment of Tel, Ib, Hasda & Mund.

Keeping the historical facts stated above in mind, and the views of great Engineers of our land such as Sir Viseswaraya, Dr.A.N.Khosla, and others the Mahanadi valley should be developed in a complete and comprehensive manner, with combination of old and new thoughts.

The upland flood can be moderated by building up of small small reservoirs on other tributaries such as Ong, Indra, Suktel, Burtong & Manjore and if possible as per suggestion of 1938-39 flood enquiry committee by diverting a portion of flood through Delta cut to Chilika lake. But unless the lake ecology is studied, Orissa may lose her most beautiful landmark.

In delta area permanent escapes may be constructed and they may be designed to spill only at shelf carrying capacity of flood embankment of various river systems. The drainage channel from the escape point to out fall point will have to be improved and residence in close vicinity to drainage valley will have to be avoided. Houses should be built on raised mounds and high plinthed. Random construction of spurs and hard surface by packing should be avoided which cause worse effect at other places. Further encroachment to flood plains and closure of branches be critically examined. A river never eats away land, it only builds; locally some points may be affected, but to reasonable extent that has to be tolerated.

FLOOD MODERATION BY "NATURAL DAM" AT TIKARAPARA

We are thinking of making a dam to protect the Delta. But, nature has been kind enough to provide a natural dam upstream of Tikarpara. The dam, being made by nature is a perfect one in the sense that its moderating effect increases with the severity of the flood (i.e. increasing runoff). However, this natural dam is not controlling the floods, but only moderating them.

The natural dam consists of the narrow valley from upstream of Tikarpara to beyond Sonepur. The modus operandi of this Natural Dam is due to regulation effect of the discharge by the narrowest portion of the gorge, a little ahead of Tikarapara. Here, the width of the river is only about 1800 feet at 100 meter contour level of uniform width. Therefore, for every extra 0.4 lakh cusecs discharge of water, the level has to rise by about 1 feet, in the upstream portion of the river. It has already been suggested that a discharge of 25 lakh cusecs be taken as a design value for flood control of Delta. With such a discharge the level in the gorge and upstream will rise by about 23 feet above the 1982 level. Keeping in mind the slope of the river it will result in inundation of areas beyond Sonepur, i.e. upto about 380' contour. It amounts to a huge storage without any extra efforts. As per statistics of Dr. A.N.Khosla (1964) the storage capacity at a constant level of 310 from Tikarpara to upstream comes to about 6 m.a.f. Under flood conditions where slope is appreciable, a detailed study is required to estimate the storage. But, in the conditions discussed, it will definitely be beyond 6 m.a.f. and may be of the order of 10 m.a.f. It is obvious that the floods are moderated significantly due to the narrowness of gorge. Even the construction of a bridge there can increase the effectiveness of this natural dam if the bridge is made over the narrowest portion of the gorge.

The moderation effect of the gorge is a matter of relief for the people living downstream of Tikarpara, but, is a matter of concern for the people living upstream. It justifies the suggestion of making flood control efforts at a level of peak discharge of about 25 lakh cusecs and not 31 lakh cusecs or 45 lakh cusecs.

The flood control of 25 lakh cusec peak discharge downstream of Tikarpara amounts to control of flood for a run off which can cause peak discharge significantly above 25 lakh in the absence of the effects of the narrow gorge.



Pix : Manoj K.Pradhan.

Indravati flash flood which resulted in loss of crores of rupees.

COMMITTEES/EXPERTS APPOINTED BY THE STATE

1) The Orissa Flood Enquiry Committee, 1959, recommended strengthening of the existing embankments, river draining works, protection to towns and villages, sluices to drain off water-logged areas within the saline embankments, provision of flood storages in the Bhimkund and Salandi reservoirs, and, construction of embankments along the Subarnarekha river.

2) The Technical Expert Committee on Cyclones and Tidal floods, 1971 recommended artificial dykes with afforestation at about 1 km from the sea coast, keeping open the river to other outlets required for efficient drainage of the area, provision of sluices for preventing tides from entering inland, and new drainage cuts in the area subject to drainage congestion.

3) The Subarnarekha Committee, 1972, recommended provision of flood storages in the proposed reservoir at Chandil for flood moderation and embankments in West Bengal and Orissa in a coordinated manner. Improvements of drainage in the lower basins, measures for improving flow conditions, and providing straight cuts to the sea were also recommended.

4) The Irrigation Commission (1972), made the following observations : "Roads, railroads and canals cause obstruction to drainage in many places, because their structures are designed with an eye to economy, with the result they cause an afflux in water levels and create congestion. At road crossings, most often, only causeways are provided, which cause considerable afflux at times of floods, just when it is essential for drains to function efficiently.

Cross bunds are often put up across drains, sometimes with the permission of the authorities and sometimes without, to divert or pump out water for irrigation, or to facilitate navigation, or fishing. Generally, these bunds are not entirely removed after they have served their purpose. As a result, the drains deteriorate and their normal functioning is affected.

5) The Working Group on Flood Control, (1978) suggested : "Certain areas on either side of the existing and proposed drains (including rural drains), should be declared as green belts, where no building or other activity should be allowed. This will not only facilitate improvement of these drains in future, for taking discharges on account of growing urbanisation, but will also help in minimising the damage due to drainage congestion, whenever rainfall of higher frequency than designed, is experienced. These green belts at suitable locations, can also be developed as parks and gardens".

ILL EFFECTS OF FLOOD CONTROL

Apart from the two views advocated, the very fact that flood control has an ill effect on the deltas, needs some rethinking of its strategies. Flood control has almost always caused problems like bed rise, growth of marshy lands and consequently appearance of diseases and problems of drainage. On the other hand, people in flood prone areas have learned to live with floods. They have learnt to adjust and cope with it. The occurrence of floods brought with it rich top soil (Patu) to the lands making it more fertile. This is now deposited in reservoirs.

After the construction of the Naraj anicut the average annual discharge in the Kathajori fell. This resulted in the rise of the level of the Kuakhai bed, at the point of its bifurcation from the Kathajori. Thus floods are becoming rare in the low & medium floods levels in the Daya-Kushabhadra sector. This has led to the development of 'moribund' conditions & insufficient drainage, with the result that yield per hectare of rice has declined in this sector.

From past experience, it is obvious, that in the years of no floods, water hyacinths develop in the marshy areas of usually flood regions of the lower reaches of the Mahanadi delta. This ultimately results in the spread of disease, as in the case of West Bengal and Bangladesh. Similar conditions have developed in the 'irrigated and protected' tracts of the Birupa-Brahmani and the Mahanadi-Chitrotpala-Luna sectors, where for the three continuous decades (1921-51) the absolute population, instead of increasing, has declined.

As a result of the implementation of flood control measures, the problem of drainage in the flooded tract has become an important issue. Marsh formation & water logging in the lower reaches of the delta is developing. Ultimately the subsoil water level will rise. This may in turn lead to a fall in the crop yield per acre, because of formation of salt pans in the irrigated areas.

EMBANKMENTS : NOT THE SOLUTION

Embankments lead to considerable breaches and flooding in the delta areas, more so, when accompanied by heavy precipitation. At present, more than 6000 km. of test relief embankments are existing in the State. There is no single individual test relief embankment which protects an area exceeding 1000 ha. A Committee of Engineers has recommended the transfer to the Irrigation Department, for maintenance of 964 km of these embankments, which conform to the Master Plan, satisfy the minimum required spacing, provide saline protection and do not interfere with natural drainage. The Committee also decided to abandon such test relief embankments, which provide no direct benefits against flood, but function as secondary protection.

In Orissa, it is considered that test relief embankments, taken over and maintained by the Irrigation department, will provide protection from low floods. Having a crest width of 1.52 m and height not more than 0.91 m. they are considered useful only against low floods and give only partial relief. However, if constructed indiscriminately, they cause afflux and obstruct free flow of drainage. No separate assessment has been made of the damage caused by breaches, overtopping etc. As a rule, they are repaired by the Revenue Department, each time there is a breach.

On the whole, it is felt that, zamindary embankments did provide limited protection to areas intended to be protected. But these were found to be inadequately planned and designed, which was natural, as these were the efforts of individuals, who had insufficient data and limited knowledge. Most of these embankments are substandard, aligned very close to the river banks, and subjected to frequent overtopping, breaches and erosion. Test relief embankments are also by and large, of the same standard. Another drawback is that these embankments were not maintained.

In the case of Orissa after the transfer of the 1st relief embankments to the Irrigation Department, the Technical Advisory Committee (TAC) of the State, examined the condition and the effect of these embankments and decided to improve the useful ones to the OAE standards and to abandon those not considered useful. A recommendation has also been made to make the top of such useful embankments fit for inspection, by moorum topping.

The Irrigation Department, which also handles the flood control works of the State, has the necessary technical facilities to maintain these embankments as well. No special action or attention is considered necessary to demolish the superseded embankments, since it is observed that due to the high rainfall, such embankments get eroded and disappear in course of time.

GOPABANDHU DAS ON FLOODS IN 1920

Pandit Gopabandhu Das moved a resolution in Orissa - Bihar Council on 10th September 1920 for survey of water-ways in coastal Orissa with a view to devising measures for the proper drainage of the country whereby the destructive effects of inundation might be mitigated and the sanitary conditions in the rural areas be improved. He said, "It may be useful here to note some of the causes and circumstances which are said to increase the liability of the country to be flooded more frequently and to increase the duration of floods and their destructive character :-

(1) "The general belief among the people is that the opening of canals on one side of the river keeps the land on the opposite bank exposed to floods. As a matter of fact, the lands on the opposite side of the canal-embankments are not protected by any embankments, & the people of the unprotected side are not allowed to raise bunds over 3 feet high on their own private lands for the protection of their houses and fields on the grounds that such bunds may affect the canal-embankments. (2) Some experts are of opinion that the embankment system was an initial mistake. The volumes of water do not find a sufficiently wide passage through the embanked channel of the river, and thus overflow the banks, rendering the river gradually shallow by deposit of silt and sand. On this point, Sir William Hunter says : 'Owing to a well known peculiarity of alluvial rivers the water which is flooded down upon the plains greatly exceeds the volume which the lower channels are able to carry off. The rivers issue from the hills heavily laden with silt, which they deposit when the velocity is checked by the dead level of the delta. The beds thus get gradually shallow and prove more and more unable to carry off the floods to the sea, so that every year a large quantity of surplus water pours over the banks'. (3) The mouths of some of the rivers and estuaries are said to have been blocked up with silt or sand, rendering the quick discharge of water extremely difficult, if not,impossible. Mention has been made in official documents of the closing of the mouths of the Chilika lake. (4) Considerable portions of the existing embankment have been abandoned by the Government, and owing to their long disrepair the area which they used to protect has become more liable to be inundated. (5) Causeway and weirs have been constructed at several places on the embankments, i.e. the one at Achyutpur in the Puri district, and have been causing damage year after year. Large cultivated areas of the locality have become absolutely waste and desolate. I went to see the damage caused this year by the Achyutpur causeway to the neighbouring villages, a few days ago, and am convinced that a large number of people over a considerable area have been suffering for several years on account of this causeway. (6) Private proprietors or tenants often raise village embankments to save their own lands from flood. These embankments obstruct the free passage of water coming down from villages situated higher up. (7) Many old natural channels and distributaries of rivers are in course of time being filled up, their connection with the main river being discontinued and are gradually coming under cultivation.

"I don't, however, venture to express any opinion on these causes and circumstances which undoubtedly determine largely the course & action of floods & give in varying degrees causes of complaint to the people of the different localities concerned. But I submit, Sir, that they call for a careful examination which is absolutely necessary in any endeavour for the solution of the flood problem in Orissa. I do not suggest that definite action is to be taken with regard to the canal-embankment system. I do not say 'let all the canals go and the canal embankments be demolished' nor do I press for erection of protective embankments on both sides of all the rivers throughout the country. All I want is a comprehensive survey of the whole situation by a body of able and experienced experts, with a view to collect materials for the formulation of a scheme of work which should be undertaken in a broad and liberal spirit of statesmanship to ameliorate the conditions of so many of His Majesty's loyal subjects.

"The embankments on the other rivers are numerous but small and made without any reference to any general system of protection from floods. If they do good to the village in which they are situated, they often do harm to the villages on the opposite bank by throwing the set of the current on to the other side. A general scheme of embankments having reference to the whole district instead of as at present for the benefit of particular villages or landholders is urgently needed".

Divergent views are advocated by various schools, with regard to flood management. One school believes in confining the extra water within the limits of the channel, not allowing it to spill over the delta. The disadvantages of this are obvious. It will mean permanent damage to the countryside and to the land itself. Of course, such a process will free the mouth of the river, from sand bars, but consequently river beds will rise with level formation and make the river more flood prone, as was proved in the floods of 1955 and 1981. Again, it is difficult, if not impossible to check floods by this method, since embankments are not percolation free. Moreover, embankments have to be raised to keep pace with the rise of the river beds. Consequently, at the maximum point, breaching will be more frequent. This is not therefore, a permanent solution.

Abolition of Embankments : A second school advocates the opposite extreme, of the abolition of all embankments. This will allow free and natural spilling all over the delta. Yet such a thinking needs examination. An area of 3,294 sq.km of the Orissa plains are now protected by embankments. Moreover free spilling leads to levee formation and in case of breaches, new channels will be opened up, leaving the old one to deteriorate. However, do the people really want this as a solution ?

EMBANKMENT HAVE CAUSED MORE ILLS THAT GOOD



Embankments have caused more ills than good.

RESERVOIRS ?

The tendency to make multipurpose reservoirs, with storage space for each utilising function separately, allows the conflicting interests of each function to work, without affecting each other. Mahanadi has a multipurpose (Hirakud) reservoir, but it does not have storage specifically earmarked for flood control. A judicious reservoir filling schedule is made and adopted to use the same reservoir space for irrigation, power production and also for flood control. Most often, such judicious decisions made by engineers are not realistic as happened in 1980, 1982 & 1994. Considering the seasonality of rainfalls, the reservoirs found to be rather resulting in increasing flood meanance.

At present some medium irrigation reservoirs have been constructed in the tributaries of Mahanadi and some more are under construction and planning. But unfortunately, there is no flood space in these reservoirs. They do not afford any flood control at the critical time, i.e. the later monsoon period. Thus when need for flood control arises, these reservoirs are almost full.

It will be useful to an extent, if flood control reservoirs, are constructed with sufficient sluicing capacity, to allow the river to flow almost unhindered, carrying its natural silt load downstream. Such an arrangement may give reasonable protection, against high flood for a considerable length of time.

Presently, the Delta Embankments are safe for 9 lakhs cusecs at head of Delta. They can however, pass a flash flood of 9.5 to 10 lakhs cusecs, if the duration is not long. According to the Hirakud Dam Project and Delta Project report, they should have been strengthened for undivided flood of 12 lakhs cusecs.

The Hirakud Dam Technical Advisory Committee, 1974, opined that the Delta Embankments should be strengthened suitably, to pass safely an undivided flood of 12 lakhs cusecs at Delta Head and another 2 lakhs cusecs by way of encroachment into the free board. <u>But the present embankments falls short of the said standard.</u>

During high floods they are subject to (a) over topping (b) Erosion of the river side slope, by the current of the river, or by overlapping (c) Caving in of all the banks (d) Infiltration from the foundation (e) Infiltration from the dike and slipping on the landside slope (f) Leaks, as a result of holes dug by Rats, Crabs, White Ants, or from the rotten roots and cracks due to the shrinkage of soil (g) Loosening of the dike by the action of wind, or large tree planted on the dike (h) Human action (i) Other miscellaneous causes, like improper supervision and paucity of flood materials and flood fighting efforts.

Seasonality of Floods Occurrence : The flood frequency analysis has revealed that the floods in the major rivers of the Orissa Coastal Plan show a marked tendency of seasonality in their occurrences. In this largest river, Mahanadi, the floods of high medium and low magnitude used to occur more frequently between the last quarter of July and first quarter of August along with stray occurrence in the pre and post monsoon period. As regards the seasonality of occurrence of flood in the Brahmani, there are two peak periods i.e. in the last quarter of July and August. But in case of low floods, the distribution is confined to the entire length of the monsoon period of July, August and September. the floods in Baitarani are experienced in three phases in long gaps of several weeks which is strikingly a peculiar feature of this river.

Probability of Occurrence : The probability of occurrence of flood in the rivers of the Orissa Coastal Plain vary according to their magnitude. The return period of a high flood in the Mahanadi is nearly five years, for Brahmani and Baitarani four years, whereas for the low floods, it is nearly two years. It has also been established that the lag time between the flood at the coastal plain and the peak rainfall in the catchment basins vary according to the size of the catchments and the length of the drainage channel of the trunk streams. This ranges from three to four days for the Mahanadi, two days for the Brahmani, and for all other rivers it is one day only. It can also be inferred that the recurrence interval of floods are directly proportional to the flood magnitude whereas the frequency of occurrence of floods bears an inverse relation with it.

The river Kathajori-Devi must have master plans as this is now taking the major share of the Mahanadi floods. At present, the Kathajori system takes about 62 to 64% of the undivided flood in the Mahanadi Delta and Devi-Kathajori alone, takes about 45 to 48% in case of very high floods.

Barrage type control structures are required at all the bifurcations, for allowing designed optimum flood in each branch, in turn, during monsoon months, to keep the channels trimmed to carry the peak flood discharge at times of need. The arrangement incidentally will help, in pushing seaward, the saline water front in the coastal aquifer and giving sweet drinking water to the inhabitants.

Water Reservoir helps to generate electricity,but not to control floods.



Pix : Ghani Zaman for CPSW.

INCREASING FLOOD DAMAGE AND INTENSITY PIX : EASTERN MEDIA.

THE ENVIRONMENTAL LINKS

Flood problem is caused by high rainfalls and aggravated by due to increasing deforestation, soil erosion, siltation and rise in river-beds as well as chocking of river channels. This issue in connection with floods received maximum attention during 1980s. This argument neglected the fact that floods in Orissa are age old and have their devastating impact on people. Of course, in recent times, the frequency and severity of the floods have increased. More number of flash floods are also reported in different places every year.

HIGH RAIN FALLS & CYCLONIC STORMS

Floods generally occur when the flow of water exceeds the normal run off capacity of a natural channel. Although such a phenomenon may occur at any time, it occurs more frequently in certain seasons and months of the year, than in others.

Factors like soil erosion, silting of river beds, deforestation, overgrazing, misuse of land in the upper reaches of the river, cyclonic storms and depressions and even human intervention, in terms of embankments and dams, can cause floods.

Rainfall : In Orissa, it has been observed that floods are frequent in the monsoon season, giving sufficient justification to say that rainfall is a major factor of floods in Orissa. Instances of severe floods, caused by rainfall, are the Vansadhara flood of 1980 and the Ganjam flood of 1990 respectively.

Land : Rain Ratio- Floods vary according to the capacity of channels, the amount and periodicity of rainfall in the catchment basin, as well as other determinants, like topography, size and shape of basin, distribution of tributaries, season of year, condition of ground surface, temperature etc. But above all, it is the precipion frequency, which determines the magnitude and intensity of flood damage. It is unlikely that heavy rainfall occurring at wide intervals will cause floods. However, a small cumulative amount of rainfall, packed into a few hours, causes high floods.

Apart from seasonal rains, rainfall brought about .by cyclonic storms and depressions drastically affect the flooding tendencies of rivers. Studies on Mahanadi reveal, that ninety percent of its annual flow occurs during the monsoon period, of which a very high percentage has its source in cyclonic weather. Generally, such storms and cyclonic disturbances occur during the months of July-October forming mostly West of 90°E. In July the origin is north of 18°N which gradually shifts southward, to north of 8°N by October. Initially they move in a west to north-westernly direction and subsequently close to the coast. Finally they recur and move north, north east as the monsoon advances.

Interestingly cyclonic disturbances have traveled along the direction of the flow of the Orissa river which automatically aggravate the flood problem.

In the recent past, severe cyclonic storms have been reported in November, 1942, October, 1967, October, 1968 and the historically severe cyclone of October, 1971. There have been minor cyclones during other years. In Orissa, cyclones are usually experienced in the months of October and November. At this time, the Kharif paddy is generally in the flowering stage. Serious damage to the paddy crops is caused as the flowers are blown off by strong winds. Also, as in Andhra Pradesh, trees are uprooted, kachha houses are blown away, many pucca buildings collapse and there is loss of human life, cattle and property. The very economic structure collapses when a cyclone strikes the coastal districts.

The coastal districts affected frequently are Ganjam, Puri, Cuttack, Balasore and Mayurbhanj. The fertile land affected is up to an extent of 25 km inland. 75 per cent of the people in this area depend on agriculture and 5 per cent on fishing. About 90 per cent of the population live in thatched roof houses.

The weaker sections of society are not able to improve their economic condition on account of frequent floods, saline inundation and severe cyclones.

The intensity of the cyclone that swept over the coast during October 1971 and which was one of the worst in living memory is not well understood on account of limited observation points along the coast in this region.

Increasing flood intensity and damage.



Pix : Eastern Media.

The maximum wind speed attained has been reported to be 163 km per hour. The maximum wave height is about 5.6 m. though the tidal surge experienced in different places has been noted to be of the order of 3 to 4 m. Another problem in this region is the presence of a number of inlets into sea which allow the tidal waters to be driven inland to considerable distances, causing damage on both the sides of the creeks.

Table - 9 : Cyclonic Disturbances Occurred during 1891-1960

Month	Zone extending 20° to 22.5° N Total Number of Dipressions	Storms	Dissipation of Depression	Storms	Striking coast Gopalpur to Calcutta Depression	Storms	Storms occurring in nearby seas (easterly to westerly direction) & hitting the Orissa coast.
July	92	24	9	21	58	30	5
August	93	14	12	14	70	22	6
September	59	14	6	1	55	16	2
October	14	4	2	3	9	8	2
November	7	5	1	2	-	5	1

Less Numbers & Intensity : High Loss

Bay of Bengal (BoB) experiences less number of cyclones in a yea. 6-7% of the total number of cyclones occur in BOB where as 40-50% occur in North IC. In terms of the wind speed and pressure defect, the cyclones in India are of less intensity.

Table - 10

Area	Wind Spread	Pressure defect
Global	317 kmph	850 mb.
India	226 kmph	999.7 mb.

However, in terms of loss, 12 out of 15 severe cyclones occurred in BoB. Again, Orissa having such a very very small coast experiences the highest number of cyclones. The data for the period 1990-1993 is presented below :

State	No.of Cyclones		(1990-93)	
Orissa	**101,**	**A.P. 68,**	**W.B.**	**65**

Source : Dr.U.C.Mohanty's NCMRUF, New Delhi.

Strong winds and storm surges cause more loss and heavy rainfall which also results in flooding situation. Near Balasore and Paradeep, the sea is 4-5 mt. deep. High tides resulting from storm surges, comes upto the height of 8-9 mts. These storm surges are very harmful. People get washed away by saline inundation as it happened in 1971. Sea level in the coast has been silted up due to soil erosion and sedimentation. Hence, its impact is intense in 20-25 kms of the coast. Other reasons for which this situation is aggravating are :

1. Population Growth, Migration and settlements in the coast.
2. Industrialization and other developmental activities.
3. Low cost houses in the vulnerable areas.
4. Accumulation of Hazardous substances

RIVER SYSTEMS OF ORISSA

Floods in Orissa, occur mainly in the deltas of the Mahanadi, Baitarani, Brahmani and the Subarnarekha. Ironically, these rivers originate outside the state. Mahanadi, Orissa's largest river, has its source in the Maikal mountains of Uttar Pradesh. Entering the state from the North West, Mahanadi stretches along a large part of West Orissa and after forming a gorge at Satkosia, drains into the Bay of Bengal through many distributaries which abound in the districts of Cuttack and Puri.

Both the Baitarani and Brahmani originate in the Southern slopes and North West flanks of the Chotanagpur plateau respectively. After flowing through the Keonjhar plateau, the Baitarani joins the Brahmani in its deltaic stage and drains into the Bay of Bengal. The Subarnarekha originates in the Chotanagpur plateau of Madhya Pradesh and flows along the north east border of the state. Therefore, its impact over flooding and drainage is relatively low in comparison with the other three rivers.

Another group of rivers, namely, the Vansadhara, Nagavali, Sileru and Saberi have their source in Orissa itself, but except the Vansadhara none of them are significantly related to floods, as they drain only a very small area of the state.

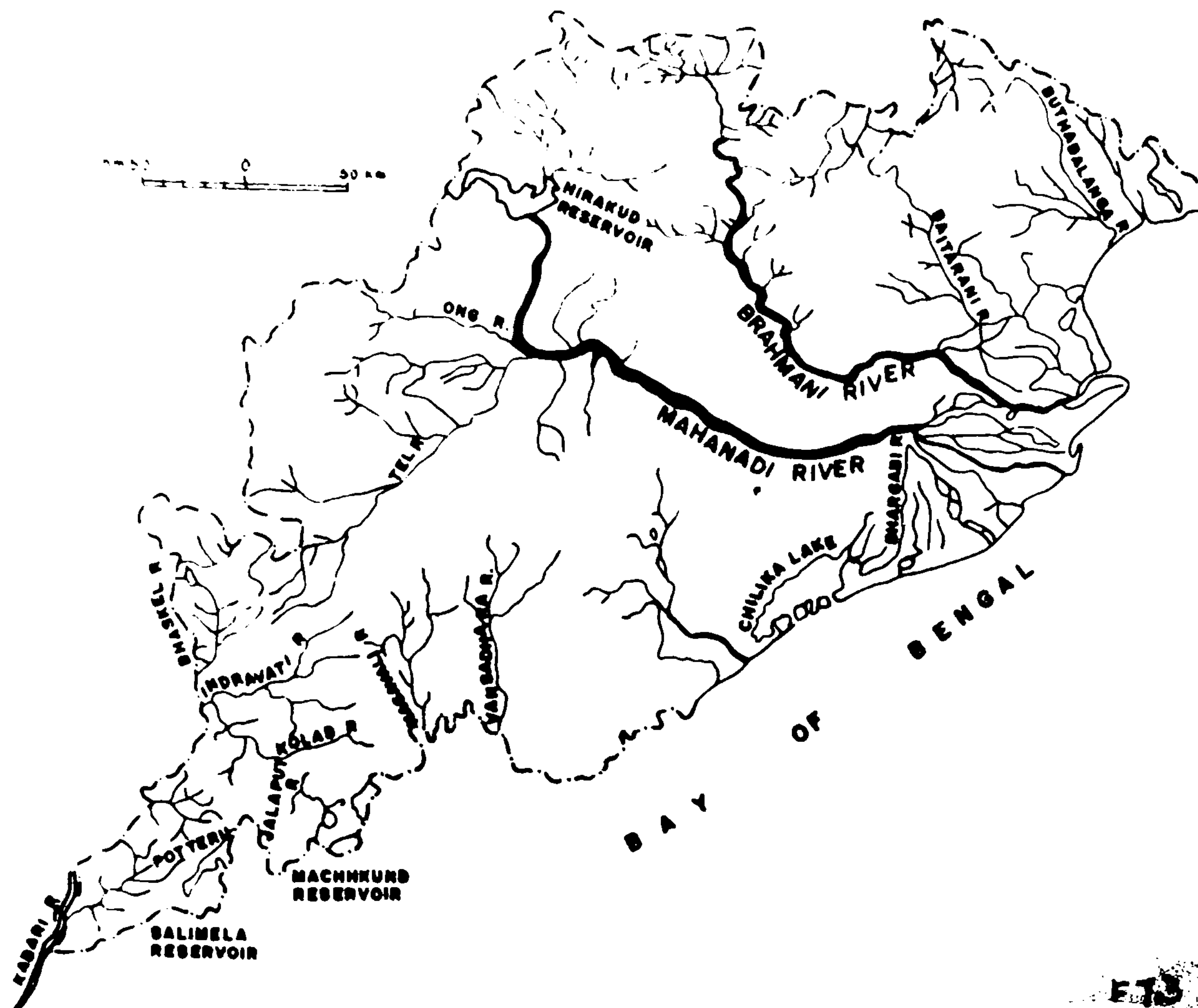
Table - 11 : Rivers Flooding the Coastal Plain

COASTAL DISTRICTS	RIVERS
Cuttack	Mahanadi, Baitarani, Brahmani, Birupa, Kharasuan, Gengtis, Devi, Kathojodi, Luna Chitrotpala, Paika, Prachi (now dead)
Puri	Mahanadi, Kusabhadra, Daya, Luna, Ganpanala, Kusumi, Prachi
Balasore	Baitarani, Subarnarekha, Jalaka, Budhabalanga Genguti, Senasangahar

Geology and Ground water condition : Geologically greater part of the Orissa Coastal Plain is formed by the deposition of tertiary and recent alluvium, sand, silt, clay and loam brought down by the rivers draining through this region. The soft, porous and unconsolidated sediments favour for a high water table supported with the network of the deltaic rivers and distributaries and perennial irrigation channels which bring sufficient amount of fresh water in the rainy season. The frequent floods, local rain, abundant surface run-off, the presence of swamps, marshes and lagoons together nourish and recharge the ground water reserve. Thus during the period of heavy rains and flood, these conditions do not allow percolation or seeping and the rate of percolation is reduced to almost zero. On the contrary adverse conditions of water logging and drainage congestion intensify the flood situation.

Geomorphology & Relief: The coastal plain is of extremely low relief and flat topography. As a consequence, the rivers after emerging from the sub-montance tract have bifurcated and the distributaries under the low gradients are draining to the sea with meandering loops and braided channels. In the morphological evolutionary process of the coastal plain, many streams have become morbund, dead and defunct in course of the river cycle in response to the long continued river dynamics and many new spill channels have developed. Towards the coast, swamps, marshes,

RIVERS OF ORISSA



Source : OSPCB, Bhubaneswar.

joras or jhills and pat lands and innumerable cris-cross of the tidal channels occur in a continuous belt from north to south in the coastal region which do not allow for the disposal of the flood water. Along the coast the waves and tides, wind and the littoral drift are the important geomorphic agents which distribute the river borne sediments and shapes the morphology of the river mouths. The development of high coastal sand dunes and beach ridges, bars and splits chokes the river mouths in the off monsoon reason and not only prevents the entry of the rivers into the sea but also shifts the river mouths and deflects the channels. Hence the rivers have to move for a considerable distance parallel to the shore along the coastal sand dunes and sand ridges before entering the sea. It has also a profound impact on reducing the flood slope as in this process the channel length is increased and helps in lingering the disposal of flood water. Hence future strategy should be oriented towards training the river channels by straightening the meanders and out lets to the sea.

Tidal effect along the River mouths : The coastal tract of Orissa is exposed to the effect of the abnormal high ides or "storm surges"which use to occur in the ranges of 3 to 5 metres or even more during the passage of the cyclones across the coast. During the monsoon season when the rivers attain a flood stage, the tidal swell at the river mouths act as a barrier to the discharge of the flood water to the sea. This also reduces the flood slope and prolong the duration of flooding. Besides this, the 'pag' lands, the swamps and marshes adjacent to the coast are filled up by the tidal inundations and flooding of salt water which make valuable agricultural land unsuitable for cultivation.

MAJOR RIVERS & RIVER BASINS OF ORISSA

The various river basins of Orissa can be divided 10 groups have been described below :

Mahanadi Basin : Mahanadi, its basin extends over an area of 1,41,000 sq.Km. and lies between 80°' and 84°-5' longitudes and on the north by the central hills. the Eastern ghats on the South and East and on the West by the Maikal range. Circular in shape and 400 Kms. long and 60 Kms wide. It can be divided into four regions, namely (i) The Northern Plateau (ii) The Eastern Ghats (iii) The Coastal plains and (iv) The Erosional plains. Of these the coastal plains are the most fertile.

Brahmani : The sausage shaped basin of the Brahmani lies between north latitudes 20°-28' and 23°-35' and longitudes 83°-52' and 87'-3'. Its main tributaries Kaaro, Tikara and Sankh cover the states of Bihar and Orissa, the first two originating from Bihar itself. The Brahmani initially flows in a North-Westly direction, turns South and eventually flows in a South Easternly direction.

Baitarani : Originating from the hills of Keonjhar, the river traverses a distance of 356 kms. before it meets the sea. The river and its tributaries, Salandi and Matai carry the highest flood discharge in comparison with other rivers. Baitarani basin lies between east longitude 85°-45' & north latitude 20°-45' to 22°-15'.

Budhabalanga : Topographically divided into the hilltops and slopes, medium lands, low lands and the deltic coastal, the rivers triangular shaped basin lies between east longitudes 86°-18' and 87°-05' and north latitudes 21°-18' to 22°-20'.

Subarnarekha : An inter-state river, the basin of Subarnarekha is equally shaved among the states of Orissa, Bihar & West Bengal. Kanchi, Markani & Kharkai are its important tributaries.

Rusikulya : Its basin lies between East longitude 84°-1' and 85°-20' and north longitude 10°-7' and 20°-2'. One of the major rivers of Orissa, it has tributaries like the Sunei, Baghua, Plotana and Godahado.

Vansadhara : An important East flowing river, the Vansadhar's basin lies between longitudes 83°-17'W and 19°57'W. It has eight principal tributaries that are widely spread over its left and right banks.

Nagavali : Flowing east between Mahanadi and Godavari, the rivers basin lies between latitude 10°-1N and 19°-44' and longitudes 82°-53'E and 84°-85'E. It has twelve tributaries.

Budha : Originating near Ramagiri Ganjam district at one elevation of 600M, the river lies between north latitude 19°-3' and east longitude 84°-20'. It traverses a distance of 73 Km and falls into the Bay of Bengal. The total area drained by the river is 1248 Sq.Km.

Indravati & Kolab : Indravati originated in the hill ranges of Eastern ghat in Kalahandi district while the Kolab originates from the hill ranges of Koraput district. The Indravati has a total catchment area of 41,600 Sq.Km. out of which 7440 Sq.Km. lies in Orissa. Kolab, on the contrary has a total catchment area of 20,430 sq.Km. out of which 10,314 sq.km lies in Orissa.

DEFORESTATION & SOIL-EROSION

The catchment area (Orissa Portion) of Hirakud reservoir sheds in accordance with All India Land Use Survey Report. Based on study 44 watersheds have been categorised to four different priority classes, viz., very high, high, medium and low and on non-agricultural land from degradation and management point of view.

Table - 12

Priority category	Rating value range	No. of watersheds
Very high	Above 120	20
High	100 - 120	9
Medium	60 - 100	12
Low	Below 60	3

Similar is the situation in case of other watersheds. In case of Machhkund-Sileru catchment, the situation was quite alarming.

Machhkund-Sileru catchment: The gross catchment area of Machhkund part of the river is 2.23 lakh ha. and that of Sileru is 2.4 lakh ha. Of the total catchment of 4.63 lakh ha., 1.37 lakh ha is in Orissa. The reservoir was constructed providing for an annual sedimentation of 0.7645 mcm. The entire Machhkund catchment (Orissa Portion) is divided into 39 watersheds and Sileru into 19 Nos. which are categorised as follows :

DEFORESTATION RESULTS IN FLOOD HAZARDS. THE LINK BETWEEN THE FORESTS, TREES, SPECIES, SOIL, SLOPE ETC. ARE IMPORTANT FACTORS IN FLOOD CAUSATION. PIX.: GHANI ZAMAN FOR CPSW



Table - 13

Sl. No.	Category	Number of watershed Machhkund	Sileru
1.	Very High	16	3
2.	High	3	3
3.	Medium	20	12
	Total	39	18

Observation in 1955-57, indicated a sedimentation rate of 1.25 mcm per year which was about 164% of the originally assumed value. Soil erosion and siltation of channels cause serious flash flood situation in the hill region. In 1992, July 28, a flood disaster occurred in Indravati river which resulted in a Tunnel disaster. Officially 17 persons were killed in the disaster where as the number might be many more as non-official sources mention. Consecutive 3-days and high quantity rainfall was experienced once in the last one 100 year and the project authorities turned it

However, if the rain water was not gushed into the tunnel, the earthen dams constructed by the project authorities could have been washed away.

In case of Upper Kolab Project, although about 20,000 hect. of the command area in the head has steep slopes (1.5 to 2 m per km), the tail area of 20 to 25,000 hact is relatively flat with slope of 0.5 m to 1m per km. This kind geomorphology is found in Kotpad area, close to rivers Kolab and Indravati. The soils are semiper-meable to impermeable nature. In addition, 10,000 hact. in the tail area is flood prone particularly due to the spill of Indravati river which has a bankful capacity of 1,200 cumes. This river inundates the area once in 3-years. Indravati river has to convey upto 10,000 cumecs under extremely high flood condition. The lower Kolab basin is similarly flood prone with flash floods predominating.

Flood Hydrology in Subarnarekha : Full flood control in Subarnarekha is ruled out since Chandil and Ichha dams are located in the Upper and middle sections of Subarnarekha in Singhbhum district. The project also does not have any operation criteria nor rigid schedule for release of water from the dams. Comparative peaks of the inflow of dams and barrages as reported by GOB and WAPCOS are given in table - 10.

Table - 14 : Flood Hydrology

Dam/Barrage	Maximum Flood Peak (M3/sec) No. GOB	WAPCOS
Chandil Dam	29,538	34,250
Ichha Dam	NA	24,967
Kharkai barrage	19,824	18,797
Galudiha barrage	20,600	24,200

Sedimentation : The suspended sediment data of Chandil and Ichha dams are available for the years 1972-1976, 1978, and 1974,1975,1979 respectively. Such short term data is inadequate for any analysis. Periodical observations are necessary & the Bihar Government is now doing that. The predicted loss in reservoir capacity is however, summarised in Table - 11 below.

Table - 15 : Life of Reservoirs

Features	Chandil Dam	Ichha Dam
1. Dead storage capacity		
lost after 50 years	47.4%	37.9%
100 years	81.9%	66.7%
2. Live storage capacity		
lost after 50 years	12.46%	9.1%
100 years	26.4%	19.4%

The sedimentation rate determined for Chandil and Ichha dam sites is inclusive of the measured bed load which is assumed as 10% of the suspended sediment load. The original density of sediment mass was assumed to be 1.4 $M.T/M^3$.

Table - 16 : Life of Reservoirs in Mayurbhanj district

Reservoirs	% Capacity lost after 50 Years		100 Years	
	Dead Storage	Live Storage	Dead Storage	Live Storage
Haldia	52	9	67	20
Jambira	30	10	74	19
Baura	40	11	90	21

It will not only disturb the stability of the environment at the mouths of Budhabalanga & Subarnarekha but will also alter the course of the South-West monsoon that originates in north Balasore & passes through the Similipal-Meghasan Range. Consequently a great climatic change may occur in Orissa.

Hence, actual flood control in Subernarekha and Budhabalanga rivers which cause havoc in Balasore district and nearby areas seems a remote possibility as analysed by Dr.B.N.Sahoo.

VANSADHARA FLASH FLOOD

The 1980 Vansadhara flash flood is an extant example of flood caused by rainfall in conjunction with a deep depression. Most of the floods of the Vansadhara, which drains parts of Srikakulam districts of Andhra Pradesh and Kalahandi, Phulbani, Ganjam and Koraput districts of Orissa are caused by rainstorms, arising over the Bay of Bengal. The 1980 flood however rose to unprecedented levels.

Produced by a deep depression over the Bay of Bengal in September 1980, the flood situation arose out of the cumulative effect of heavy rainfall over a short period. As a consequence 6.5 lakh cusecs poured down the river as against maximum anticipated flow of 1.50 lakh cusecs. Water rose to the level of 12 ft (3.65 m) above the embank-ment at Gunupur. So quick was the gathering of flood waters that it precluded all flood warming and flood precaution measures. The waters flooded an area of 54,540 ha affecting 0.2 million people in around 300 villages. So great was the cascade of flood waters that villages near the mouth of the rivers, were covered by a standing water of 4.5 m height

SILTATION AND BED RISE

SILTATION & BED RISE IS FOUND IN ALL THE RIVERS DUE TO MASSIVE DEFORESTATION AND RESERVOIRS ON UPPER SIDE



Pix : Ghani Zaman for CPSW.

Though secondary causes, siltation and the consequent bed rise, decrease the normal run off capacity of a river and make it more flood prone. The process of bed rise is further aggravated by the extension of the delta into the sea and change of original gradient of the river. Contrary to opinion, bed rise is not caused by construction of embankments but by the extension of delta into the sea and changing slope of river, according to the UN Flood Control Series. No.2

Given the constant sea level, the rivers of Orissa remain in a quasi regime state, perpetually adjusting their morphological characteristics to changed conditions like reduction in discharge, silt charge and general water surface shape from delta head to the sea. This encourages building up of a river bed, reduction in cross - sectional area and weed growth resulting in reduced discharging capacity.

Mahanadi River : Mostly the super imposition of cross-sections show that the rise of bed level is of an average of 0.75' within 72 years (1900-1972) between Naraj Weir and Jobra Weir which is negligible. The bank width has decreased by about 200' on an average within this period.

Kathajori River : From the super imposition of cross-section, it is seen that the bed has shown a tendency of rise to an average level of 4.54' within 62 years (1990-1962) and the bank width has decreased by 300-900' on an average within this period.

Kuakhai River : The river has shown a bed rise tendency of 1.29' within 18 years (1961-79) and the bank width has decreased by about 100' in this period.

Sirua River : The river has shown a tendency of bed fall of 2.54' within 17 years (1961-1978) without showing any change of the average bank width.

Table - 17 : Comparative Study of Changes in bed of Mahanadi River System from Naraj to Jobra weir and Naraj to off take of Surua (from 1899 - 1979)

Sl.No. Name of River	Cross Section No.	Year	Rise or fall
1. Mahanadi River	1 M	1899-1900 to 1971-1972	Rise in 1971-72
2. -do-	2 M	1899-1900 to 1971-1972	Rise in 1971-72
3. -do-	3 M	1899-1900	Rise in 1971-72
4. -do-	4 M	1899-1900	Rise in 1971-72
5. -do-	5 M	1899-1900	Rise in 1971-72
6. -do-	6 M	1899-1900	Rise in 1971-72
7. -do-	1 K	1899-1900	Rise in 1961-62
8. -do-	2 K	1899-1900	Rise in 1961-62
9. -do-	3 K	1899-1900	Fall in 1961-62
10. Kuakhai River	4 K	1961-1962	Rise in 1979-80
11. Surua River	5 K	1961-1962	Fall in 1978-79

PRIORITY IN FLOOD CONTROL : FLOOD PLAIN MANAGEMENT

Flood control has largely failed in Orissa which is a age old problem. The sufferings and misery of people is increasing with an increase in the intensity of floods and their impact. There are undue priorities in certain measures and sometimes, the arguments are one-sided. The plain people start putting all the blame on hill-dwellers for shifting cultivation. Though, Environmentalists have realised the fact that massive deforestation is not resulted by shifting cultivation, and hill dwellers can not be blamed for all that has hampered. In case of flash floods, this is the case. But, Orissa's flood plains are not really affected by flash floods. The impact and frequency of flood were not so serious earlier, though the intensity was nevertheless more sometimes. Hence, this situation has more to do with the so called flood control measures and proper management of the flood plains and flood-prone areas.

FLOOD ABSORPTION CAPABILITY

Flood plain zoning and its management has become essential in todays context. Flooding and waterlogging may be caused when inflow into ground water exceeds outflow from it resulting in progressive rise of the water table. The excessive inflow may be due to infiltration from irrigation, seepage from canals, rainfall penetrations, prolonged inundation and seepage from reservoirs. The outflow from ground water may be reduced due to blockage of drainages, rise in the water level of rivers due to construction of reservoirs, etc. All these causes can be grouped into two categories. a) natural causes and b) artificial causes.

Natural causes : i) Geographical and Physical situation, (ii) Slope, (iii) Water holding capacity, (iv) Water flow characteristics, (v) Shape index of ayacut and (vi) Compactness coefficient of the ayacut.

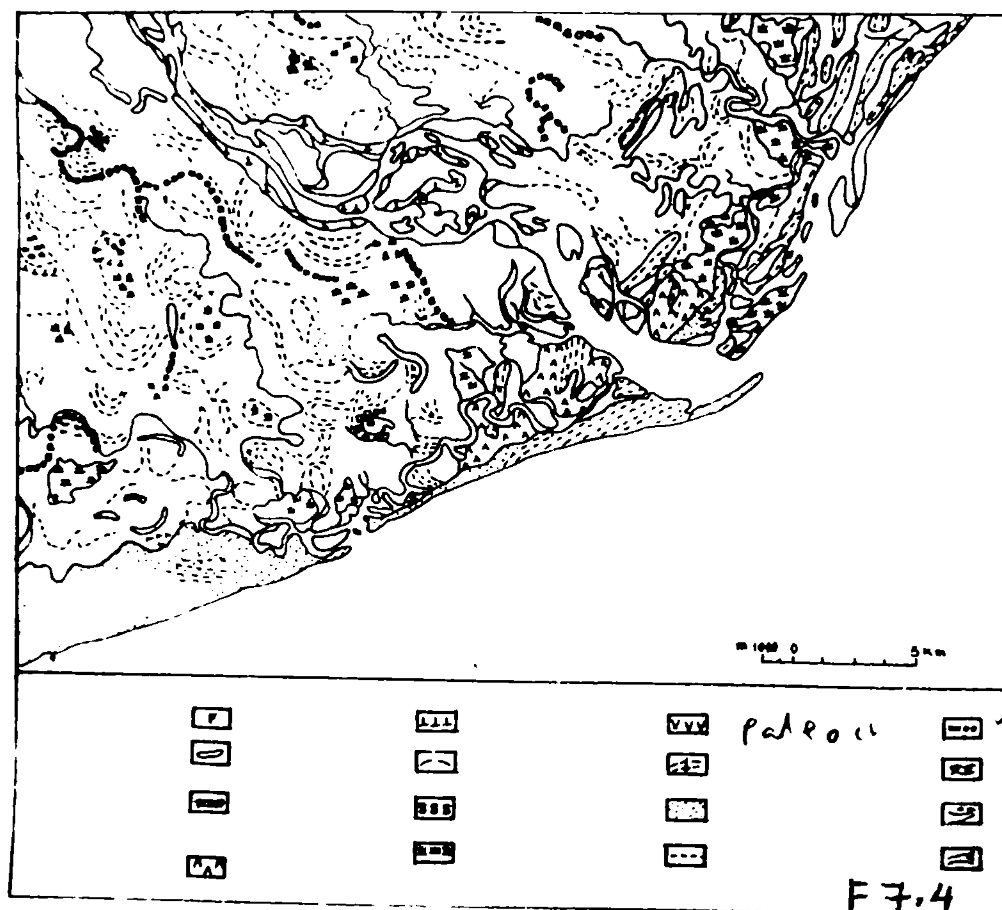
Artificial causes : Seepage from the reservoir and canals, over irrigation and nondisposal of excess water from the ayacut.

Combination of these two, types of causes give rise to serious waterlogging problems.

DEGRADATION OF WETLANDS

The data available with ORSAC, of 5,00,000 (Five lakh) hectares of coastal wetlands in Orissa. As the landscape provides, wetlands and natural depressions are found in all the areas which contain the flood waters and hence, the impact of flood was not serious. Both intensity and duration of floods was not posing any major problem. Today major issues on the coastal wetlands include inadequate database & status, conversion to degradable practices, siltation, encroachment and unplanned management. Examples are worthwhile in cases of Chilika, Samang, Sar, Jatadhar muhu, lensoid water body at Chatrapur & Babuda estuarine region. The problems arising in these areas are manifold ranging from natural to anthropogenic types. The detail analysis of Chilika wetland and estuarine eco-system has been dealt in the chapter on Natural Heritage. Also Bhitarkanika Wild Life Sanctuary, Ansupa wetland which play an important land in the coastal eco-system are discussed in the same chapter.

GEOMORPHOLOGICAL MAP OF DEVI AREA - A PART OF MAHANADI DELTA



Source - P.Kumar, Lecture Note, CZIS WorkshOp, 1994, ORSAC, Bhubaneswar

DRAINAGE CONGESTION

A large number of depressions, locally known as 'Talas', 'Beels', 'Chaurs', etc. have also been reclaimed for cultivation. Flood waters which used to find their way to these depressions and were being detained for long, now get drained off quickly. This has further aggravated the peak floods in drains and rivers. Since encroachments into drains (natural or excavated), do not have the sanction of law in any of the States in the country and since there is a general agreement that such encroachments have aggravated flood problems, suitable enactments should be made in the States, (where not existing at present), to deal with this human and socio-economic problem.

THE DRAINAGE IS FIRST BLOCKED BY ROAD AND THEN BY WEEDING AND FISHING. THIS RESULTS IN LONG DURATION FLOODS.



Pix : Manoj K. Pradhan.

River bed cultivation : Cultivation of river beds and berms is permitted in Orissa, by a short-term lease, granted by a Revenue Officer, unless objected to by the flood control authorities.

Cultivation of Diaries and Khadirs : Cultivation in the :Diaries" and "Khadirs" has not caused any significant adverse effect on the river monophology, but the same cannot be said in the case of old "Dhars" (abandoned channels) declared as "notified" channels by thee State Government (which prohibits any obstruction of use of these abandoned river beds for cultivation or fishing). Persons making use of the "Dhar" bed in a number of cases, have even acquired titles, by virtue of "adverse possession" i.e. being in physical possession of the land for more than 12 years continuously, on the basis of lease granted to them by the erstwhile Zamindars and now the Revenue Officers. Such cultivation/obstruction retards quick flow of drainage channel, causes heavy siltation at the outfall point in the main river, thereby changing its flow and regime condition, aggravating inundation of low lying areas, raising subsoil the water table and breeding an unhealthy climate. The practice of cultivation in the abandoned beds of "Dhars", which discharge into main rivers, should be stopped strictly by enforcing the existing laws. And by enlisting public support, after, sufficient education has been done about the dangers of such practices.

SHIFTING OF RIVER & DRAIN COURSES

The Geomorphology and the river system in the flood plains is quite volatile. Shifting of river courses and Chilika mouth (i.e. opening to sea) is observed by geographers and is now being studied by ORSAC, Bhubaneswar.

SUBMERGENCE OF VILLAGES ON BANKS OF BRAHMANI & KHARASROTA

Aul, 24/6/91 (Sambad) :- A number of villages situated on the banks of these rivers are living with a lot of insecurity and anxiety, largely depending on God's support. Govindpur Harijan Basti (Aul Block) with 50 families are almost on the verse of submerging into the river, but are helpless to be resettled somewhere-else. The Govt. will only resettle them after they are washed away by floods - is the kind of policy that we are following here. With slightest flooding, water flushes into the village and there is very danger for the children to be drowned in water. The villagers, basically landless, poorest and daily wage earners are not able to resettle on their own.

Similarly, 150 families with a population of approximately 1000 of the village Sahupada and 200 families with 3000 people in Manapur are living in worst conditions. Already, 10 families in Sahupada have lost their land, houses and have resettled on their own, making hots.

In Rajkanika block, 5 families of Kisannagar village have already faced a forcible resettlement and other families are waiting for one more severe flood so, also, Manikapatna village. It is only the case of a few villages mentioned, but many more are facing such disaster.

Such things need more careful analysis before any measures are initiated. The map of Dhamara river and the land use around it is presented in this chapter which was prepared by ORSAC. This gives an indication about the nature of land use and shifting of river mouths and courses in the adjacent areas to sea. Only stable banks such as Cuttack city on Mahanadi river for example do not fall into the river. The people in ancient times had their wisdom to select the place for their settlement. Now, many villages on the bank of such rivers are on the verge of submerging into the rivers.

<u>10,000 acres of crop lands joining the Mahanadi Drain.</u>

Paradeep 20/7/91 (Samaj) :- Till now, 2000 acres of land have already been lost and another 10,000 acres are facing submergence of six villages near the Paradeep port. All the land are facing saline inundation by tidal water. It is reported that one new mouth was opened near Mahanadi mouth in September, 1981. Since then, the course change and soil erosion is taking place, even half of the 17 number canal is fully damaged. Water is flowing above 50 ft in these areas. Also, this has created danger for the Atharabanki canal. Though some efforts were made in 1984, the people are not protected yet.

Rehabilitation and resettlement of these villages is going to pose another major problem in future. In 1992, to resettle such a village called "Satabhaya" in the Mangrove Forest areas of Rajkanika created a big controversy. Unless proper land use practices are followed and river beds are properly treated, this problem will aggravate in near future.

20,000 families suffering in Genguti Kimbhiria basin

Badachana, 27/7/91 (Sambad) :- Birupa-Genguti island consisting of 14 GPs is normally flood washed by the release of excess water from both Mahanadi and Brahmani. For flood control, people's demand, visit of ministers resettled in action-plan for construction of embankments on both sides of the mentioned basin. However, when funds were allocated only for the right side one of the Genguti river, the left side inhabitants of Badachana and Dharmasala blocks protested. Then, the work stopped and again restarted in 1982. However, no comprehensive effort is initiated yet to control flood and irrigate the area. People are organising meetings and discussions, foundation stones are laid, but actual work is not satisfactory. The people are demanding to strengthen the left side embankment and construct flood sluices at Patnali mouths to release excess water from the "Patas" of Sagadia Nala, Rainsala Nala, Radhadeipur Nala, Santipur Nala, Bainsijora and Mohura Nala. This is a most complicated area and needs planning with people's wisdom and participation.

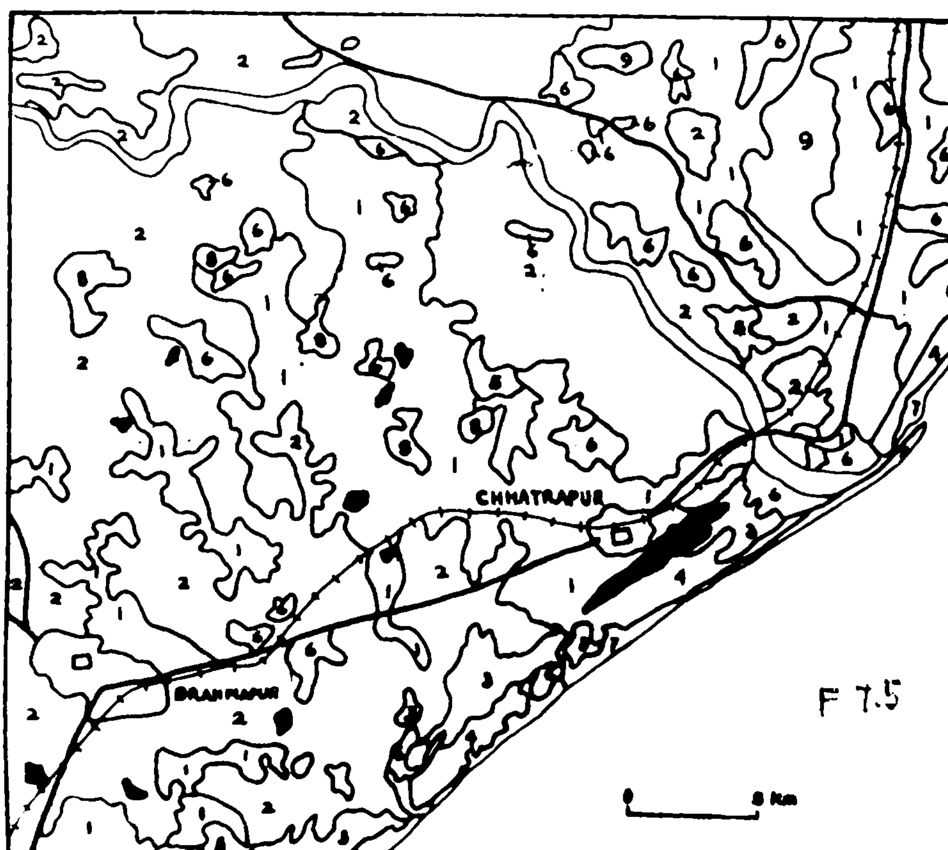
SOLUTION TO THE PROBLEM OF DRAINAGE

The problem of drainage is most acute towards the lower reaches of the deltas. The coastal ridges offer an effective barrier to a free discharge of the flood water. Lagoons and lakes of varied sizes create marshy conditions and affect standing crops, like winter paddy. The Sur Lake and the Samagara Pat near Puri are completely filled with flood water during the rains. Thus cultivation of winter paddy in their beds and in the adjoining areas, becomes impossible. These areas have to be devoted to Dalua paddy cultivation. The problem of drainage has become very acute, due to the low gradient of the valley long profiles.

The Dhanua basin, the Atharanala, the Sur Lake sea-cut and the Dhanua river serve the purpose best, as far as drainage is concerned. After the construction of the Sur Lake cut, the intensity of the flood damage decreased, but a complete change in the pattern of land utilisation has also occurred. Winter paddy instead of Dalua, is being cultivated. Rabi crops are gaining ground. Even though this belt requires more drainage, cuts to the sea and the Kadua-Prachi area, suffer from lack of drainage. The areas around Chilka Lake are also subjected to flooding, making drainage facilities there a dire necessity. In the Devi-Dhamara sector, lack of drainage is not so prominent, as this comes under the area of 'protected and irrigated regions' of the delta.

The narrow opening of the Chilka mouth should be broadened and two new cuts in the old mouths of Chilka should be opened and regulating sluices should be constructed, for a free and quick discharge of flood water during the rains and also to offer an effective check to the incoming saline tide water in winter. If this is done, the adjoining areas will be extensively devoted to double cropping and the yield of winter paddy will become high.

LAND USE/LAND COVER AROUND TAMPARA (CHHATRAPUR)



Source - P.Kumar, Lecture Note, CZIS Workshop, 1994, ORSAC, Bhubaneswar

A cut to carry, say, five lakhs cusecs of flood water to Chilika, while being used as irrigation and power channels during the monsoon months and taking off from the pond of the flood control dam, will reduce the salinity of the lake water, in addition to helping in gradual reclamation of low lying areas. However, the brackish nature of water is lost, then it will loose the acquatic life peculiar to the lake.

DREDGING

For a quick discharge of flood from the Bhargabi, the mouth of the Nua Nadi and the Harachandi, must be kept free from sand bars. The Sunamukhi and the Atharanala should be also kept in a serviceable condition, for a quick discharge of flood water from the Samagara Pat and the Sur Lake, respectively.

Mahanadi at its mouth, is subjected to strong littoral drift along the coast, from south to north. In the process, spits and bars are formed in front of the river mouth and the river tends to flow north, parallel to the shore line, for some distance. This increases the length of the river and creates difficulty of bed rise and consequently rise in the flood heights when it asks for slope adjustment. Several other complex phenomena happen and the river becomes inefficient in discharging its flood flow, which gets further aggravated by sea tides. In some very high floods, the bars are washed away and the river again gets its opening to the sea directly. This has been the practice with the Mahanadi mouth and also the Devi mouth, which are the two important mouths on the Mahanadi system. Only such spits or sand bar formations should be dredged out and the river mouth should be kept directly open to the sea. This will greatly improve the carrying capacity of the river in the tidal zone and thereby turn an aggrading river into a degrading one.

DIVERSIONS

Diversion of the flood flow is made, to relieve the original river course to some extent. The diversion may be to an adjacent valley, to a lake, or to the sea, through another route. It may also be done in a parallel channel, which joins the main river further below :

(a) Diversion from upstream of Hirakud, to Brahmani valley through Tikara river. This is possible and is being discussed for providing additional spill way capacity at Hirakud. The Brahmani valley is subject to flood hazards. Probably it cannot take further floods from Mahanadi, as there is a distinct possibility of both floods synchronizing at the same time. A study of records will show flood occurring simultaneously at Brahmani and Mahanadi quite a few times. Hence, this diversion though topographically feasible, may not be practicable and acceptable to the dwellers of the Brahmani valley.

(b) Diversion to Chilika through Daltola cut near Banki. This is topographically feasible, but the cost is prohibitive, as the depth of cutting is high and the control of the course of the spill channel downstream of Daltola reach, is uncertain. Both Captain Haris and Sri M.Viseswaraya, suggested the construction of a dam downstream of the junction of Mahanadi and Rana Nallah, to reduce the depth of Daltola cut and to have some flood waters stored in the reservoir. This also appears to be quite costly, but this may allow reasonably silt free water in the Daltola cut to Chilika and this reasonably silt free water may not destroy the ecology of Chilika to a great extent. But if constructed, such a diversion will be required to operate only on exceptional high flood years and may not actually destroy the ecological balance of Chilika lake. Hence it is recommended that Daltola cut may be executed, with a capacity of about 2 lakh cusecs, in very high floods.

(c) A portion of Mahanadi water is naturally being diverted through Birupa, one of its drainages to the Brahmani basin. Earlier Birupa used to carry its own share, which has since been diminished. Now Birupa shares only about 7-10% of the undivided discharge. A case for maintaining the old status quo, by improving the Birupa channel was made, but the same is frozen for discussion, as a barrage with a diminishing waterway, is being constructed downstream of the old anicut.

OTHER RECOMMENDATIONS

Experts suggest few other things are :

1) All existing medium reservoirs to be modified to have reserved flood space, for storage, and control of flood waters during widespread rainfall.

2) In the medium projects under construction, or under planning reservoir space should be kept reserved for flood control, to be operated as above.

3) Kuakhai should be closed with a regulating structure, so that regulation to safe carrying capacities of Puri rivers, can be provided, upto undivided flood of 14 lakh cusecs. Following this, the natural distribution has to be resorted to, in order to distribute the damages. And such will require construction of Master embankments on either side of Kathajori and Devi, so that in addition to its higher share of water, it can take an extra share, due to closure of Kuakhai. Again this needs a thorough examination.

Dredging operation of the Chilika mouth was inaugurated by the Chief Minister of Orissa in 1992 and in the next rains, every thing was washed off.



Pix : Manoj K.Pradhan.

4) Masterplans for flood control should be prepared and all expenditure on flood control should be strictly a part of such work. No new embankments are to be constructed, where the Delta has not grown up sufficient height.

5) Flood plain encroachment should be stopped forthwith. At least the encroachments within the scope of capital embankments, should be removed.

6) Kuakhai bed at the off take is rising even without floods. This is due to construction of a fairweather road and jafri, to arrest the sands blown by the south wind. A structure on Kuakhai may solve this problem.

8) An independent authority, designated as "Mahanadi River Authority" should be established and vested with all powers, for works of flood control of an original nature, in the Mahanadi.

These recommendations only provide pointers, towards a substantial moderation of floods in Orissa.

LIVING WITH FLOODS : THE BEST WAY POSSIBLE

Dr. B.N.Sinha says, "A harmonious control of the floods is thus desirable. A portion of flood water should be allowed to flush the region, so that the inundation canals do not die out and the river channel below the proposed dam sites, don't get choked up".

People on the flood plains were knowledgeable and wise to live with floods. The floods carried rich topsoils ("Patu") and made their lands fertile. Also, they got lot of fish on their fields and other water bodies.

It is desired to develop strategies to live with floods with less damage. Assam Government is implementing a scheme by which they are constructing "Raised Platforms" to help people take shelter at flood times. Also, it is necessary to strengthen the rescue and relief operations.

FLOOD WARNING AND FORECASTING

Weather forecasting has had limited success. Even then it could be used to alert people and also in the operation of reservoirs and sentention of basins. Although not scientific in the normal sense, it would probably be worthwhile, to apply available scientific data to the astrological framework, for arriving at, if possible, accurate and useful information, for weather forecasting. But care should be taken not to publicise uncertain findings, precipitating panic situations.

DISASTER REDUCTION

There is a need to improve our Natural Disaster Mitigation system atleast to save lives and loss of property. Dr. V.C. Mohanty feels that a lot gaps remain in our existing knowledge, Experiences and practices. In application, disaster preparedness and mitigation have to be taken into account together. Certain operational aspects such as detecting the tropical cyclones, forecasting, warning and immediate desimination of informations in case of change in predictions are essential to achieve the goal. This has to be a well coordinated effort of all related actions. Also, Dr.Mohanty recommends for (1) Collective/Cooperative Research, (2) Demonstration Projects (3) Information collection & Desimination, (4) Technical Assistance, (6) Technology Transfer & (7) Education & Training.

In Orissa, there are 15 existing Meteorological Information centres which are not adequate. There is a proposal to establish 27 more centres by 1997 which can help in reducing the damage.

Droughts, Floods and Cyclones are affecting the rural economy very badly and the impact in becoming more and more intense. Hence, there is a gap in our efforts and the measures are not scientific more often. Hence it is decided to take up more scientific and [illegible]ive efforts with more and more people's pa[illegible]pation. This can help to face such serious problems.

River bed silting up, change in River Courses, lack of trees are resulting in submergence of riverside villages into the river - A village scene on Brahmani Bank in Rajakanika block.



Pix Sanjay K. Khatua

SUITABLE CROPPING STRATEGIES FOR FLOOD AREAS

In general, for low and medium land experiencing long duration floods, with shallow depth, kharif rice followed by rabi pulses like mung or 'urad' (biri) in rotation is popular with the farm[illegible]. For uplands experiencing short duration floods, jute followed by paddy, followed by 'rabi' vegetables, or potato, or oilseed, are common. **The state government however has recommended certain crop practices, to minimise the impact of floods.**

Preservation of mangroves is essential which act as walls against cyclones.



Pix Sanjay K Khatua

Table - 18 : Recommended cropping pattern, Orissa

Land situation (topo sequence)	First Crop	Second Crop	Third Crop
Irrigated high &	jute	paddy	pulses/oilseeds
medium land	early paddy	—	wheat/pulses/ oilseeds
Medium & low	jute	paddy	paddy
Low	paddy	paddy	—
Unirrigated	jute	paddy	—
		paddy	pulses/oilseeds
	jute	—	oilseeds

In Orissa, lift irrigation from river, tubewell, and dug well are increasing for intensive cropping in flood prone areas, to eventually minimise, or obviate the production loss, due to floods.

At present, the Department of Agriculture is ready with contingent cropping plans, to meet the flood situation. According to the local situations, intensive cropping pattern of jute-paddy-pulses/oilseeds for irrigated areas and jute-paddy, jute-oilseeds, or paddy-oilseeds for unirrigated areas have been recommended. The farmers in the flooded areas are advised to use flood resistant paddy varieties of FR. 43-B, FR. 13-A, evolved for such conditions.

Preservation of Natural wetlands and drainage channels :

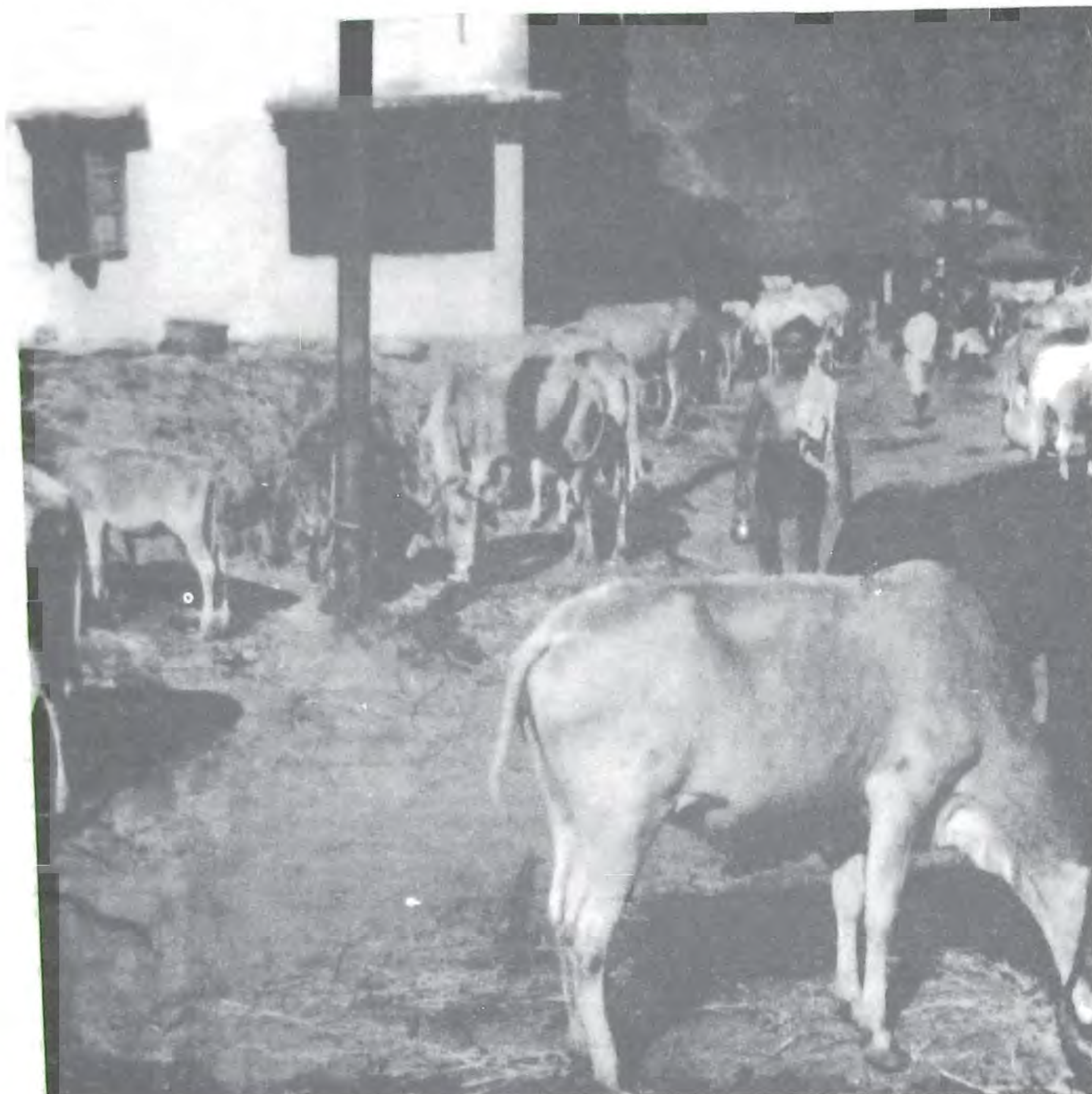
Specific Action-plans should be implemented to preserve the wetlands and drains with people's participation. This will enhance in crop yields even in normal times. This is not going to be an easy task either.

PEOPLE DEMAND *TO ARREST THE ENCROACHERS*

Paradeep, 8/7/92 (Pragativadi) :- Thousands of farmers of Ersama constituency demands to arrest the encroachers of river courses applying the National Security Act. Excess water from 25 GPs of this constituency mainly released through the Hansua and Brudha rivers to Atharabanki and Jatadhari. But, vested interest groups with the support of political parties, have constructed hundreds of "Adibandh" to catch fish. As a result, the flood water is unable to be released and standing crops are damaged. People submitted memorandums to the Tehsildar, Kujanga and eminent political leaders like Sri Damodar Rout and Sri Loknath Choudhuri demanded the arrest of illegal encroachers. The District Collector visited the area, butt no steps were taken. Then, some farmers collectively broke some of the bunds. Then, they were threatened by these vested interest groups. Now, the farmers of Ersama and Kujanga are collectively pressurising the Government and trying to protect their lands which seems the only possible way.

Flood Politics : Construction and repair of embankments and dams with investment of thousand crores of rupees id a combine exploitation of our Engineers, Contractors and Politicians. Each is a beneficiary in the process and goes an advocating for more such measures. Each time before the flood occurred and once flood takes place, news papers start highlighting the breaches in embankments, the story of old embankments and the need for new embankments to protect people. Politicians start staging dharanas and sbumit memorandums to the Govt. for more dams and embankments. This helps them to gain in triple ways, one from getting more votes and in the second, getting their commission from contractors and engineers for their party. Then, more floods bring more relief to the area. And sometimes, even the honest politicians don't understand the implication of such demands and join the race. There is a lack of will power and effort to talk to the people and learn from them. And the end result is that the people are the sufferers who are the mute observers and are instruments of play. As long as the affected people don't realise this and raise their voice, this game will continue.

Animal wealth is an important part of rural socio-economic and cultural life.



Pix : Sanjay K. Khatua.

ANIMAL RESOURCES

Livestock wealth plays a crucial role in rural life. It is the major source of draught power and fuel, of income, of nutrition and source of manure. Rural transport and rural life is unthinkable without the handy and dependable bullocks and bullock carts, which have become part of our heritage. So much so that innumerable 'Sagadia Geeta' and 'Halia Geeta' (cartman's song and tiller's song) have been composed by anonymous rural composers and are still hummed. It provides employment to a number of landless and small farmers and saves lots of precious fuel, which would have been spent in transporting men and materials. A research study reveals, that the work animals perform in India save six million tonnes of petroleum per year.

The importance of livestock in rural households is manifold. Livestock are the only wealth in many a rural households, sold or mortgaged in cases of emergency. The importance of cattle is truly appreciated in the following Oriya proverb: "Maharaga Gai, Sangrama Bhai" - in case of acute shortage of resources, the cow comes as handy as in a quarrel, does one's brother. Animal sacrifice or animal meat in socio-cultural and religious functions, is a part of life in tribal societies. Rearing of animals for these purposes, saves many a tribal family from incurring loans with exorbitant interest.

In not so distant past while negotiating marriage proposals, in rural Orissa, the number and health of the bullocks in front of the house and the size of the hay stack at the backyard, were used to be considered the essential indicators, to determine the status of the family. In recent times a number of other factors have gained importance, in determining the social status. Nevertheless, the socio-economic importance of possessing cattle, have not been totally lost, though rearing of livestock has undergone a sea change, owing to changes in income generating opportunities and the changes in the availability of required bio-resources in the village surroundings.

DISTRIBUTION OF THE LIVESTOCK : REGIONAL VARIATION

Orissa occupies 4.7% of the total area of the Indian Union and possesses 12.9 million of India's 192 million cattle (1982 census). The density of cattle per square km. is 82.98 in Orissa against the national figure 58.41. Traditionally, places with higher intensity of cultivation have higher concentration of bovine population. Thus there is a high concentration of the bovine population in Balasore, Cuttack, Puri, Ganjam and Sambalpur. This is so, primarily because the cattle are used as draught animals. The density of cattle per sq.km. of area is the maximum in Balasore, followed by Cuttack, Puri and Ganjam districts.

LIVESTOCK CENSUS : DECREASING TREND

The livestock position in the state as per the fourteenth quintessential livestock census of 1991 is presented in table - 1

Table - 1 : Livestock Position of Orissa, 1991

		Total population	% of Individual category
Total livestock population (cattle,buffaloes,goats, sheep,pig)		223,20,970	
Total Cattle		135,77,157	60.82
Cross breed male		16,01,417	
Cross breed female		4,01,927	
Indigenous male		66,88,891	
Indigenous female		63,24,922	
Buffaloes :	Male	8,24,557}	
	Female	6,84,362}	6.76
Goat :	Male	16,41,752}	
	Female	31,62,529}	21.52
Sheep		18,40,670	8.24
Pig		5,89,945	2.64

Cuttack has the highest cattle population and Phulbani the lowest. But the density per square kilometer is highest in Balasore. The highest buffalo population is found in Koraput and lowest in Balasore. Koraput has also the highest poultry population.

In Orissa, the cattle population has gradually increased while the percentage of growth has decreased during the last 10 years as compared to the previous years. Except buffalo the population of all other animals show a decreased percentage of annual growth during the last 10 years. The percentage of cross breed milch cow in the state is increasing every year at the rate of 4.5% as against 1.01% of deshi cows.

The ever decreasing grazing space, general decrease in the availability of bio-resources and the resultant increase in demand on manpower to rear livestock has caused this decreasing trend.

Table - 2 : Growth of Cattle Population in Orissa

	Cattle	Buffalo	Sheep	Goat	Pig	Others	Total	Poultry
1961	9809680	1074968	993801	2381518	208589	59615	14528251	66,47,652
1966	10532472	1204481	1181885	3081139	160188	81811	16261926	76,98,042
% of A.G	(+)1.46	(+)2.4	(+)73.75	(+)5.875	(-)2.723	(-)7.38	(+)2.386	(+)3.160
1966	10532472	1204481	1181885	3081139	180188	81811	16261926	76,98,042
1972	11495602	1390013	1369416	2883775	386907	33463	17568176	84,52,245
% of A.G.	(+)1.83	(+)3.226	(+)3.2	(-)1.281	(+)22.94	(-)11.819	(+)1.606	(+)1.959
1972	11495602	1399013	1369416	2883775	386907	33463	17568176	8452245
1977	12120904	1319159	1432209	3416395	294849	3900	18587416	9571447
% of A.G.	(+)1.09	(-)1.14	(+)0.917	(+)3.693	(-)4.758	(+)17.669	(+)1.160	(+)2.648
1977	12120904	1319159	1432209	3416395	294849	3900	18587416	9571447
1982	12929738	1333208	1989788	4931256	417705	952	21602697	10676076
% of A.G.	(+)1.334	(+)0.21	(+)7.786	(+)8.868	(+)8.333	(-)15.117	(+)3.244	(+)2.308
1982	12929788	133208	1989783	4931256	417705	952	21602697	10676079
1991	13577157	1508919	1840670	4804281	589945	733	22321705	12441871
% of A.G.	(+)0.55	(+)1.46	(-)1.498	(-)0.286	(+)4.581	(-)2.556	(+)0.369	(+)1.837

N.B. : A.G. - Annual Growth

TYPES OF LIVESTOCK IN ORISSA : COMBINATION OF LOCAL & CROSS BREEDS

The common livestock found in Orissa are cows, buffaloes, sheep, goats, pigs and poultry.

Bos Indicus : is the common Indian breed cows found in Orissa. Among the cross bred cows introduced to boost milk production - Jersey and Holstein varieties have gained popularity in Orissa. The better varieties of cattle found in the country, like Redsindhi (from Punjab), Haryana (from Haryana) and Sahiwal (from Rajasthan) have been brought to Orissa for increasing the productivity of the existing livestock.

At the state level, certain better varieties of cattle have been identified from among the local breeds found in particular places, such as - Binjharpuri (Cuttack), Ghumsari (Ganjam), Khariali (Kalahandi), and Mottua (Koraput). They are found to have good potential to be used for draught power and the state govt. has proposed to work on them for their better production. There are only two varieties of indigenous breeds of livestock found in Orissa - Paralakhemundi buffalo and Ganjam goat - that are recognized at the national level. The other better local varieties

of buffaloes are found in Kalahandi, Chilika, Kujanga and Sambalpur regions. Of late, the state Govt. has taken interest in conservation and improvement of the local varieties. Paralakhemundi buffaloes are transported all over India. Cross breed Murrah buffaloes have at present been introduced in Orissa.

The common varieties of goats found in Orissa are Ganjam and black Bengal. The Ganjam goat is the best in the state and is recognized at the national level. In the goat farms of Orissa, Jamunapari and Barbari from Uttar Pradesh are reared for better production of meat. Local breeds of sheep found in Orissa are non-wool type and are reared for the purpose of mutton. A number of rural industries, such as sugarcane crushing, oil extraction etc. would be virtually impossible without livestock.

POPULARITY OF SMALL ANIMALS - IN INLAND AREAS

The other members of the livestock group are more frequent in the inland regions. Various occupational groups, economically and socially marginal families, supplement their income through rearing of various small animals such as goats, sheep, pig etc. As per the 1991 census there are 48,04,283 goats, 18,40,670 sheep and 5,89,945 pigs found in the state. Density of goats and sheep are found to be an average of 30.83 and 11.81 per square kilometer, respectively. Concentration of goats (area wise) is highest in Balasore (58.08) followed by Mayurbhanj (50.86) and Bolangir (44.09). Balasore has the highest goat population (11.26%) followed by Mayurbhanj (11.1) and Koraput (10.47%). Similarly Cuttack has the highest sheep population (13.41%) followed by Bolangir 913.03%) and Koraput (12.51%).

In various hill tracts of Orissa, now under varied bio-resource stress conditions, people prefer to rear goats because of their superior adaptability. Participatory appraisal in a Soura village, Badadeula in Rayagada block, by Indo-Swiss Project team (Orissa) reveals a trend of increased goat population, and both male and female villagers, identified goats as first priority in a ranking exercise. 20-25 years back only few families were keeping goats. Now most of the families own these small ruminants.

It is observed that keeping goats has two main purposes :

- On festivals it is common to consume meat, therefore several times in a year goats are slaughtered.

- Goats have the function of a saving institution. In case of an emergency (sickness or food shortage) people dispose of a goat in order to get cash. Last year (1991) eight to ten male goats were sold out of the village. The price wavered between 300 and 800 rupees as per the size of the animals. Seventy-six per cent of families of this villages have more than two goats per family. Only 45 per cent of households of this village own paddy land (about .5 acre per family) and in addition to this they are engaged in shifting cultivation. Four streams flow in the surrounding of this village. But they become dry during the summer season. Deforestation and soil erosion are becoming acute day by day. The increase in goat population in this area is feared to have grave implication on the depleting resources.

RISE IN GOAT POPULATION : NOT ECO FRIENDLY

"The rapid rise in goat population has alarmed many environmentalists. The goat is often considered harmful for soil conservation because it consumes all ground vegetation. It is accused of seriously increasing the aridity and lowering the productivity of arable land. Some countries have enacted laws to force decline in the goat population" observes the Second Citizen's Report, CSE, Delhi.

A study on grazing in forests proposed a ban on the rearing of goats and setting up of grazing farms to prevent the livestock from entering the forest. While goats endanger forest by destroying seedlings and preventing natural regeneration of forest, sheep are more destructive due to their preference for eating away woody plants to herbaceous ones, says the study by Dr. Ram Prasad, Director & Mr. Prativa Bhatnagar, a researcher, at the Madhya Pradesh State Forest Research Institute.

Field observations clearly corroborate the declining trend of livestock population. Cattle census in two villages namely Kansil (Bolangir district, drought prone, degraded grazing lands) and Karatanga (Binika block, Subarnapur district, reduced grazing land due to encroachment and intensive cultivation), revealed the possession of only 3 cattle head per family. Cows constitute only 20 percent of the total cattle population. Villagers stated that 20-25 years before they had at least 6-7 cattle head per family.

LAMENT FOR THE INDIAN BUFFALO

Only recently India hosted the second World Buffalo congress in New Delhi. As the home of over 50 per cent of the world's buffalo population of 140 million, and having the best breed too, it was appropriate that the Congress be held here. 600 delegates - 150 from 36 foreign countries - attended the meet which focussed interest on the appalling conditions in which the buffaloes are made to live.

In India, buffaloes contribute 55 per cent of the 44 million tonnes of milk produced in the country. Also, as an excellent drought animal, 10 million buffaloes play an important role in ploughing and carting. Even in death they contribute to man's welfare. They provide one million tonnes of meat, and byproducts, such as skin, blood etc. The market value of their various outputs, whilst alive and after death, amounts to Rs.16,000 crore per year in India which contributes to roughly four per cent of the GNP. Long years of apathy have caused enormous wastage and loss which have adversely affected the precarious livelihood of the poor rural millions, who raise and use buffaloes for milk, work and dung as well as for meat and leather. To millions of farmers, buffaloes represent the major means of production. Therefore, better management of the buffalo system in India would certainly benefit those who rear them and those who use them in one way or the other. The female buffalo population in India vastly outstrips its male counterparts. There are only 8 million males to over 35 million females. This imbalance in the sex ratio is because approximately eight million male buffalo calves prematurely die of starvation and dehydration, or are slaughtered. In terms of revenue lost the amount may be about Rs.800 crores every year.

PER HOUSEHOLD POSSESSION : REGIONAL VARIATION

Village resource appraisal carried out by one Grampanchayat located in coastal irrigated area (Kuhudi, in Marshaghai block, Kendrapada district) and village environment appraisal carried out by CPSW, Bhubaneswar in the villages located at different degrees of proximity to degraded & semi-degraded forests, present interesting insights into the situation of livestock possession.

Table - 3 : Average per Household Possession of Livestock

Category	Kuhudi GP 9 village 995 ha	CPSW appraisal 6 vill.338 ha
He Buffalo	—	.25
She Buffalo	—	.05
Ox	78	1.68
Cow indigenous	78	1.22
Jersey Cow	.09	—
Calf	.43	78
Goat	.24	71
Sheep	.29	.28
Poultry	N.A.	.93

Though there is a higher incidence of livestock in close to forest or forest villages, compared to the irrigated coastal areas, the general trend, as reported by people, is decline in livestock population, especially cows and small animals. The main reason is the lack of enough grazing land & the consequent demand on manpower, which is out of reach due to economic reasons. However, as observed in these villages, the population of bullocks have been increased owing to family divisions and increase in share croppers and encroachers. In the 6 villages observed by CPSW, 49 landless families have 30 bullocks (share cropping and encroachment).

BIO-RESOURCE AVENUE : A CRUCIAL FACTOR

A marked difference has also been observed in possession of livestock by different category of land owning families, of villages located in varied degree of bio-resource affluence. In the village which is bio-resource rich to some extent, the per household possession of livestock is higher (6.27) compared to the villages located in intensive agriculture areas (4.67). This is even less, in densely populated irrigated areas. However in both the situations, land owning families possess more number of livestock, in comparison to landless, or marginal land owning families. Per household possession of livestock (buffalo, ox, cow, goat, sheep) is as per degree of land holding.

Table - 4

Land-owning Class wise	Livestock possession per family	
	Karatanga *	Mankadachuan **
Land less		
0.01 to 2.5 AC.	3.4	4.4
2.51 to 5 AC.	6.8	6.6
5,01 to 10 AC.	6.3	12
10 + AC.	14	12

* Irrigated, intensive cropped, close to degraded forest 15-20 years before

** Non-irrigated, close to semi-degraded forest.

All these go to establish, that among other things, change in the situation of grazing land and availability of bio-resources, have played a major role in the general decrease in the growth of livestock and increased inequalities in livestock possession, among the different land owning families.

Under the prevailing conditions in Orissa, the standard requirement of grass land is estimated at 0.8 hectares per livestock.



Pix : Sanjay K Khatua.

Household possession of domestic animals depends on so many factors. Just to make a shed, one needs so much of wood

LIVESTOCK DISTRIBUTION & GROWTH TRENDS IN GANJAM & GAJAPATI DISTRICTS

Indo-Swiss Project Orissa for sustainable land use, animal husbandry and dairy development has conducted numerous stock taking exercises during its pilot phase from April 1991 to March 1994 in the Ganjam & Gajapati districts of Orissa. It is found that more than half the rural households keep livestock. The predominant species is white Zebu cattle (11 lakhs) followed by goats (3 lakhs), water buffaloes (2 lakhs) and sheep (1 lakh). Large ruminants first of all fulfill the draught requirement of the farmers as the level of mechanisation is extremely low. The traditional dairy animals are the she buffaloes while the proportion of the crossbred Jersey cattle population lies below 2% of the total cattle population. Under the prevailing situation in Ganjam and Gajapati district, crop husbandry and animal husbandry are closely inter-linked. The predominant livestock species are bovines (11.1 lakh cattle and 1.9 lakh buffaloes compared to small ruminants, (2.9 lakh goats, 1.3 lakh sheep). The main reason for keeping bovines is to get draught power to cultivate the agricultural land. In the two districts, 2 lakh pairs of bullocks are under the yoke while only few hundred tractors and power tillers are operating (Schmidt 1993, p.38).

The graphs presented in the above figure indicate an enormous growth of the white cattle population from the fifties until 1972. The explanation lies in the growth of the human population that caused an increase of the number of holdings and simultaneously of the number of draught animals. But during the last twenty years a consolidation or even a slight decrease of the cattle number can be observed.

The buffalo population is growing steadily at a low rate perhaps as a consequence of a growing milk demand. The small ruminants experienced a growth until 1982 probably pushed by a growing meat demand. In this context it is surprising to notice that the growth of small ruminants should have become negative during the last decade. First of all, the livestock census figures of small ruminants in 1982 are hardly believable. But secondly, the decreasing (or stagnating) number of small ruminants could indicate a restricted access to fodder resources or their over exploitation (Schmidt 1993, p. 14)

On an average, every second rural household keeps ruminants. Livestock ownership has a direct correlation with the size of the operational holdings.

Table - 4: Distribution of households in landholding categories and proportion of households keeping ruminants.

Land holding category	Proportion of households belonging to category (%)	Proportion of households keeping ruminants (%)
Landless	34	20
Marginal farmers	46	63
Small farmers	15	92
Large farmers	5	98
Total/Average	100	54

Source : House listing of 3122 households in 18 sample villages, ORG 1993.P.148).

The fact that the proportion of households keeping ruminants is increasing with the holding size can be explained by the higher requirement of draught power and manure in case of larger holdings. The huge number of white cattle in the two districts is entirely determined by the cultivators' draught power need. The main function of female cattle is to produce bullocks. Milk and dung are welcome byproducts. The situation is different in the case of the water buffaloes which serve a dual purpose. She buffaloes are kept for milk production while the male buffaloes are used for traction after castration. Dung and horns are side products. Small ruminants fulfill the meat demand of the non-beef consuming Hindu population. Only 36000 pigs were counted in the livestock census 1991 from which one can say that piggery is comparatively unimportant. In addition to that piggery is restricted with a social taboo. Only harijans and certain tribals keep pigs and consume pork.

Livestock keeping generally, the shed is constructed in front of the house.



Pix : Sanjay K. Khatua.

Keeping of livestock is a caste specific phenomenon. Of course bullocks are kept by all cultivators. But keeping of dairy animals, particularly of she buffaloes, is concentrated with the Gouda caste, the traditional dairy farmers, herdsman and milk vendors. Keeping of small animals is burdened with a social stigma. In the past the Brahmins were strict vegetarians and therefore till today they hardly keep small ruminants or poultry. The traditional rearers of small ruminants are the Golas who sometimes earn their livelihood through goats or sheep only. Generally speaking the maintenance of small ruminants is confined to resource poor families. Usually livestock is the property of the head of the family who is a male in most of the cases.

AGRICULTURE-FORESTRY-ANIMAL HUSBANDRY FARMING SYSTEMS IN PRACTICE

A combination of the factors like agriculture, forest and animal husbandry is resulting in four main farming systems. But they differ in importance with regard to the number of farm households involved and the area covered by them. The distinction is not however a rigid one. Obviously predominant is the Farming System 1 that could be called "Settled cultivation in the plains." The farm households belonging to this farming system sustain on crop husbandry. To fulfill their draught requirement they keep bullocks while female cattle is reared to get offsprings that can be used as bullocks in future.

The Farming System - 2 is situated in the plains too but is having a more important animal husbandry component. Hence, an appropriate name for Farming System - 2 is "Settled cultivation and animal husbandry". The dairy farmers (she buffalo and cross bred cattle cow owners) belong to this farming system. The Third Farming System, very similar to Farming System -2 is "Forest and Animal Husbandry" In certain areas of Gajapati District (Gosani, Rayagada, R.Udayagiri, Mohana Blocks) and in some hilly tracts of Ganjam District a traditional buffalo keeping system still prevails. Members of the Gouda caste keep local buffaloes or types of the Parlakhemundi Buffalo throughout the year in the forests and move along to places where fodder resources are available. She buffaloes are milked and the milk is processed to Ghee and "Dohi Chenna", a local cheese. These products are periodically carried to urban centres and sold there.

Having a sole component - Animal Husbandry implies that the households belonging to this system are landless in the sense that they do not operate a crop based farm holding. In this farming system, a particular caste, the Telgu speaking Golas, are the traditional rearers of small ruminants. They drive their large flocks (around 50 to 100 animals per household) daily to the hilly areas during the cultivation season. But during the agricultural off season the small ruminants are sent to the harvested paddy fields. The landowners pay a reward to the Golas for the manure obtained. The herdsman who take care of the countless village herds are usually resource poor Goudas. Sometimes they own some animals by themselves to supplement their income from the herding fees and the sale of the collected dung. Another peculiar system of keeping white cattle prevailing in the plains and uplands is called Kila Gotha (pegged herd). Usually a resource poor Gouda family (or SC/ST) takes care of a herd of 40 to 60 white cattle. The animals belong to one or few large farmers who don't pay any remuneration to the family which looks after their animals. But this family can sell the collected dung and get a reward if they peg the herd on a farmer's field for manure purpose. Besides that they may sell the milk which is usually a small quantity.

Table - 6 : Livestock ownership in the four Farming Systems (own calculations basing on village maps of PRAs conducted by CENDERET 1993 and Dash/Mishra 1993)

Percentage of households owning Livestock

FS	No. of Villages	Milch cattle	Cattle bullocks	Cattle total	Milk Buffalo	Buffaloes	Small Ruminants
1	6	24	36	47	7	10	5
2	6	29	33	45	13	16	5
3	7	n.a.	40	40	n.a.	12	11
4	2	n.a.	18	25	n.a.	0	38
	21	—	32	34	—	10	15

Animal Husbandry Farming practice is household and area specific.


Pix : Sanjay K. Khatua

CROSS BREED CATTLE : INCREASING TREND

The percentage of cross breed milch cows in the state is increasing every year at the rate of 4.5 per cent as against 1.1 per cent in case of deshi cows. The cross breed cattle is mostly found in Cuttack district followed by Puri and Sambalpur.

The importance attached to cross breeding programme to enhance milk production and production of egg and meat does not seem to be based on ground reality. The owners of cross breed cows complain of poor quality of cross breed calves to be used as drought animals. Cross breed dairy animals need a package of improved feeding practices for balanced diet which is beyond the reach of marginal and small farmers. Cross breed animals require recurring health care.

Table - 7 : District-wise distribution of crossbreed and indigenous cows

Sl. No.	Name of the District	Cattle crossbreed	Cattle indigenous
1.	Balasore	55976	1128187
2.	Bolangir	24035	897776
3.	Cuttack	137495	1872195
4.	Dhenkanal	33836	980322
5.	Ganjam	17178	1125414
6.	Kalahandi	15889	1420783
7.	Keonjhar	10871	71321
8.	Koraput	30106	527925
9.	Mayurbhanj	18521	850254
10.	Phulbani	3760	540605
11.	Puri	134383	1076597
12.	Sambalpur	64517	1247106
13.	Sundargarh	16787	635328
	Total Orissa	563354	12373813

SOURCE : Fourteenth Quinquennial Livestock Census, 1991.

INDIGENOUS VS. CROSS BREEDS IN GANJAM & GAJAPATI DISTRICTS

As regards breeds, it can be observed that 98% of the white cattle population is deshi (local, non-descript). The animals are very small and white or brown coloured. In the Bhanjanagar Sub-Division some people distinguish a local type of cattle (Ghumsuri cattle). In a thesis paper Sahoo tried to characterise this type. He found that the live weight of an adult cow is around 160 Kgs, of an adult bullock to be 180 Kgs (Sahoo 1988, p.76). An interesting aspect of his thesis is that it reports a high draught efficiency per kilogram Liveweight (p.83). In fact considering only the aspect of draught, a small but strong bullock would be best suited for the prevailing fodder scarcity combined with marginal landholdings.

Cross breeding programmes of the Animal Husbandry Department either by natural service or artificial insemination has resulted in a cross breed cattle population of less than 2% and a yearly growth rate of 8% during the last decade (Chacko/Mohanty 1992, p.6.). Following the gazetted "Cattle and Buffalo Breeding Policy for the State of Orissa" (See Chacko/Mohanty 1992, p.42-43) the breed of choice is usually Jersey, but sometimes Haryana inheritance can be detected here and there. In Ganjam and Gajapati District the female and young white cattle usually move in large village herds throughout the day and are tied or kept in sheds during the night. In the herds the cows are mated either by uncastrated bull calves or by adult stray bulls.

The prevailing buffaloes are mostly of desi type. But in certain areas (for example in Aska Block) a clear impact of upgrading with Murrah to augment the milk production is observed. The area around Parlakhemundi can be called a buffalo pocket. There, at present, the farmers are fond of the so called Parlakhemundi Buffalo, a typical dual purpose breed that is well adapted to the local conditions (Schmidt/Mishra 1992 a, p.8). Its milk yield is estimated to be slightly higher than the yields of the nondescript buffaloes. Concerning small ruminants, only one sheep breed, the Ganjam Sheep, is prevailing in the southern and coastal part of Orissa. It is worthwhile to mention that it is not shorn. The Ganjam goat is a big dual purpose (meat/milk) animal and usually moves in large flocks. They always give birth to one kid only. The Bengal Goat, is common in the northern part of Orissa but is found in Ganjam District too. This dwarf black goat is exclusively kept for meat and has an average litter size of 1.6 kg.



Pix. Sanjay K. Khatua

Crossbreeds adopt to be environment easily and economically also profitable.

MILK PRODUCTION OF THE STATE : POOR PERFORMANCE

Despite the huge cattle population, the milk production of the state is not very encouraging. A cow in Orissa yields only 158 kg, and a buffalo, 338 kg of milk per annum. When taken together, the average yield comes to only 248 kg. per head in case of the bovine population. In Bihar similar figures stand at 511 kg. Orissa's average milk yield per bovine population is lower than the Indian figure.

This low milk production is due to the general health conditions of the cattle, unavailability of enough grazing lands, fodder and absence of high yielding varieties of cattle. 'Annual growth rate of milk production during the 7th Plan period was about 35,000 MTs while the estimated annual milk production in 1991-92 was around 500 thousand MTs. An annual growth rate of 7% in milk production during the 8th Plan period is targeted so as to achieve total milk production of about 700 thousand MTs by the end of the plan period. (Animal Husbandry and Dairy Development, 8th Five Year Plan, Orissa).

An ORG study in Ganjam & Gajapati districts, found 119 households (or 29%) belonging to the Gauda caste, owning two thirds of all she buffaloes. The Goudas who constitute only 16% of the total population own 35% of the white milch cows and 79% of the milch buffaloes. (CENDERET 1993.) Looking at the pattern of the livestock ownership it can be taken for granted that the members of the Gouda caste have been playing the pivotal role in dairy development until today. The second aspect that emerges is that the traditional dairy animals in Ganjam and Gajapati Districts are she buffaloes. This statement is supported by the fact that almost two thirds of the milk collected by the Ganjam Milk Union is buffalo milk (GMU 1993). From crop husbandry the byproducts are utilised to feed the livestock while draught power and manure are inputs from the animal husbandry sector to the crop husbandry. The AHD recently introduced a scheme to improve the quality of the main byproduct and the main roughage available for feeding the livestock, the Urea treatment of paddy straw.

The argument that Milch animals are not kept because of financial constraints is not convincing. Similarly the endless demand for loans to purchase dairy animals that agencies involved in dairy development are facing day by day is more than the genuine requirement. This has to be seen as a consequence of spoon-feeding the farmers by the Government since decades. The constraint is not really valid because dairing can be taken up without a high capital investment by purchasing female calves or by breeding through Artificial Insemmination (AI). On the other hand it has to be admitted that at present the scope to get an improved animal through AI or Natural Breeding in Ganjam and Gajapati Districts is limited. Moreover this way of entering into dairy as a business requires at least three years time and a lot of patience on the farmers side. A valid constraint of the resource poor was " a lack of space" to keep ruminants. In situations like in Kotibadi (Aska, Ganjam) where the resource poor even have to struggle to get dwelling space, the availability of space to keep bovines might really be a constraint. In one village (Khajuripalli, Digapahandi, Ganjam) a blind belief restrains people from producing milk.

The following table reflects the productivity of the various species and breeds used for milk production in the area. What ever is presented here are estimations only and not the accurate figures relying on field records.

Table - 8 : Estimated productivity data of bovines in Ganjam and Gajapati Districts

Animal Breed	Age at first calving (months)	Inter calving period (months)	Mortality until 1 year (%)	Average Location length(months)	Average milk yield (lts/day)
Cattle local	41	17	11	7	0.4
Cattle Cross Breed (Jersey)	31	16	8	9	3.2
Buffalo local	40	18	58	7	1.9
Buffalo Parlakhemundi	47	23	40	15	2.5
Buffalo graded (Murrah)	36	18	25	8	3.0

Note : Column 1 & 2 : As expected by respondents of ORG study, (ORG 1993, p.107) Column 3 : ORG 1993, p.108, Column 4 & 5 : Estimates made by a group of local veterinarians (ORG 1993,p.89), modified Parlakhemundi Buffalo : Patro 1992, p.5 Patro 1982, p.83.

All these figures are highly questionable and it has to be admitted that reliable livestock production data are not available. It has also to be considered that the calves are allowed to suckle.

Although the data presented are doubtful three conclusions may be drawn :

1. The reproductivity of the local breeds is very low particularly because of the high age at first calving and the long inter calving intervals.

2. A high calf mortality caused by worm infestation is a major drawback in the case of Parlakhemundi & Local Buffaloes. The low calf mortality of Crossbreeds may be credited to the efforts of the Animal Husbandry Department.

3. Considering the presented traits cross breed Jersey cows are emerging as superior milch animals followed by buffaloes improved with Murrah. As most of the graded buffaloes are offsprings from natural service by using 50% Murrah bulls the share of Murrah inheritance might be low or even very low in most of the cases.

LOW PRODUCTION : LOWER CONSUMPTION

The per capita milk consumption in India was 107 gms daily in 1978 and around 157 gms. daily during 1987-88. In Orissa, milk production was 4.07 lakh Mts during 1987-88 (daily production 11.17 lakh Kgs) with a per capita production of 261 gms. compared to the all India figure of 1068 gms.

The per capita consumption of milk in the state was 38 gms. during 1987-88. This is far below the normal nutritional requirement of 250 gms per day. (Yojana Vol.35. No.10, 15, June, 1991).

Consumption of Dairy and Poultry products has increased rapidly all over the world in the recent years. Milk being a major component of human food is the source of animal protein to the children, expectant mothers and invalid in particular and the growing population in general. In Orissa it is obtained mainly from cows and buffaloes, except in some regions like Ganjam, where goat milk is also procured.

Information from Department of Animal Husbandry sources explain, that out of the total milk produced, an average 34.5% is consumed at the household level.

Table - 9 : Milk Use in Percentage

Season	Sold	Consumed	Converted into milk products
Summer	49.4	34.4	16.2
Rainy	51.5	35.2	13.3
Winter	51.2	33.8	15.0
Overall	50.7	34.5	14.8

The nutritive value of milk being very high, the deficiency of milk in a predominantly starchy diet results in protein deficiency. The daily intake of milk and milk products is only 0.1 ounce with the agricultural labourers in India, as against a standard requirement of 10 ounces. Thus it is only one hundredth of the standard requirement. The influence of income on the consumption of milk can not be overlooked.

Per capita income in Orissa being very low, what is needed is not only doubling the present quantity of milk production for a balanced diet but also keeping the prices of milk within easy reach of the low income groups.

OPERATION FLOOD : TARGETED AT URBAN MARKETS

To enhance milk production and to provide better avenues of income generation, the livestock programme has gone through several changes. At the time of independence, there were only two livestock breeding farms in Orissa. The objective was to produce pedigree bulls for breeding purposes and to supply milk to the various urban centres. Sale of milk at newly established state headquarters in Bhubaneswar & Cuttack was started during the sixties, with a 6000 LPD dairy plant at Fulnakhara under the Cuttack milkshed scheme. The programme could not succeed due to lack of integration of the procurement process with sale, as also problems related to quality control. The procurement process was sought to be rationalized and expanded for the first time under the Operation Flood II Programme during the eighties, as benefits of the Operation Flood I which was launched in the seventies could not be availed of, by the state. The Operation Flood concept introduced the formation of "Anand Pattern' of dairy co-operative societies, to be managed by farmers themselves. The Primary societies federate into district milk unions and the district union federates into a state federation.

The Operation Flood Programme has been extended tó five out of thirteen districts - Cuttack, Puri, Dhenkanal, Keonjhar and Sambalpur. In other districts, Dairy Development programmes are implemented through milk producer's co-operative societies. It is proposed to include Ganjam and Balasore districts under Operation Flood III programme. Three liquid milk plants have been established at Bhubaneswar, Rourkela, and Chipilima, with a total capacity of one lakh liters per day, soon to be expanded to 1,30,000 LPD.

The district milk unions have been concentrating on procurement of milk, sale of balanced pelleted cattle feed to the society, arranging upgradation of cattle through artificial insemination, and other modern technologies and providing veterinary health care at the doorstep of the member farmers. Milk collection by OMFED in the Operation Flood Districts shows a consistent increase.

Table - 10 : Milk Procurement in '000 kgs.

Districts	1986	1987	1988	1989	1990	1991
Cuttack	2588.14	4253.35	6447.32	6754.24	7162.51	6225.99
Dhenkanal	749.89	877.24	1090.95	720.13	708.36	692.72
Keonjhar	877.17	893.54	1224.54	1431.50	1953.14	2350.78
Puri	1694.97	2479.63	3279.63	2841.16	2922.42	2890.83
Sambalpur	—	—	—	826.80	2440.98	2289.58

SOURCE : OMFED Office.

The demand of milk and egg are fast increasing, due to population increase, urbanization, improvement in the purchasing power etc. But the supply of these items seriously lag behind. The 8th Five Year Plan Document observes that the milk & egg productivity in the state is quite low, compared to the national average. The Planned Livestock Development Programme has been undertaken to accelerate production through scientific breeding, better feeding and management practices with adequate health control & marketing measures. Cross breeding of cattle & development of poultry & other livestock like sheep, goat, and pig need to be intensified further to increase the production.

MILK MARKETING IN GANJAM

The Ganjam Milk Union is the only body which collects milk in the district in an organised manner. The milk union has two chilling plants at Berhampur & Aska with installed capacities of 3800 & 2000 liters of milk per day respectively. Prior to milk collection the union forms Milk Producers Cooperative Societies (MPCS) in the villages. At present Ganjam has 48 MPCS whose milk is collected through 5 milk routes in Ganjam District.

Apart from this the milk union is also engaged in milk collection in Parlakhemundi area from 9 identified collection centres. There the milk procurement amounts to 950 liters (July 1993) per day which is taken to Tekkali chilling centre of Visakha Dairy (Andhra Pradesh). In Ganjam District the union's milk procurement was about 3800 LPD in the month of July 1993. Around 20% of seasonal variation of milk procurement is found between peak and lean seasons. During monsoon, milk collection becomes high. It falls during the summer season as a consequence of the non-availability of green fodder. Generally in the farming system 2 village MPCS are found.

With more than 2 lakhs inhabitants, Berhampur is the main consumption centre for liquid milk and milk products. At present the demand of liquid milk in Berhampur town is estimated to be 23,000 liters per day.

FUTURE STRATEGY

Strategy for the eighth five year plan includes : i) intensification of cross breeding and natural breeding programme in cattle, ii) revolution isation, of poultry production, iii) provision of self employment with soft loan facility to entrepreneurs, iv) provision of health cover, v) provision of marketing facilities for livestock products, vi) training programme of farmers vii) development of small animals for supply to farmers under anti-poverty programmes and viii) development of indigenous breeds of cattle and buffaloes.

In order to achieve the annual growth rate of 7% in milk production during the 8th Plan period as against 3% growth during the 7th Five Year Plan Govt. plans to increase population of C.B cows to about 4 lakhs against the existing population of one lakh. In addition, about one lakh buffaloes are to be upgraded with better breed. In order to meet the increased demand for meat, the Govt. is ambitious as measures have been made in the 8th Five Year Plan documents - "The animals available in the state are of indigenous type and need to be developed genetically in order to meet the growing demands for meat. Hence it is proposed to strengthen the existing farms & to introduce cross breeding programme by purchase of exotic animals & supply these cross breed animals to the farmers, under anti-poverty programme and special project".

DRAUGHT POWER : AN IMPORTANT RURAL ENERGY SOURCE

The use of mechanical power is limited too because the sizes of the agricultural fields are usually very small and because tractors of power tiller require a high capital investment. Over and above the use of animal traction is probably the most ecological solution to fulfill the power requirement of the farmers. Nevertheless due to the progressing land fragmentation and a growing fodder scarcity the number of bullocks is likely to decrease which is from all angles an appreciable development. In the area three main bullock types can be distinguished.

- White desi bullocks (sometimes with Haryana and Ongole inheritance)
- Cross bred bullocks (rare !)
- Buffalo bullocks

The choice of a power source by a farmer is an extremely complex process where he is considering the maintenance costs, the capability of the draught animal, traditional and personal liking among other factors. Comparative advantages and disadvantages can be attributed to each bullock type : Desi bullocks are light, fast and cheap in maintenance ; cross breed bullocks are superior to desi bullocks in all aspects but have a higher maintenance cost and buffalo bullocks are heavy and strong but call for more labour because they are family wise herded. This is actually the main reason why buffalo bullocks mostly are kept by large farmers who have sufficient family labour or a contract labourer to take care of the buffalo bullocks. In the rural area the opinion is widespread that the draught capability of cross breed bullocks is inferior because they are less heat tolerant compared to the indigenous breeds. But farmers who had the direct comparison clearly denied this view (Schmidt 1993, p.44. CENDERET 1993, P.124).

Under the prevailing conditions of the rainfed agriculture with a clear-cut seasonal peak-demand for animal traction and small landholdings the utilisation of the capacity of the draught animals is low.

Table - 11 : Utilisation of bullocks (No. of days per pair of bullocks in a year) (ORG 1993, p.111)

	Pair days :	
	Cattle	Buffaloes
On farm	44	52
Hired out	6	7
Total	50	59

On an average, a pair of bullocks is used for 50 to 60 days per year; 40 to 50 days on ones own farm and some days it is hired out. More than 50% of hiring out is for the purpose of threshing. The proportion of use of animal labour according to season is 30 days during rainy season (mainly land preparation), 20 days during winter season (mainly threshing) and 10 days during summer (threshing and transport). There is not much of a difference between cattle bullocks and buffalo bullocks regarding the utilisation of their working capacity in terms of pair-days per year Schmidt 1993, p.42.).

On an average, bullocks might be engaged 180 days in a year for few hours. The land preparation of one acre paddy land takes six to seven pair days. The under utilisation of the bullocks can also be expressed if the area per draught animal is considered. The optimal utilisation of a pair of bullocks lies in Ganjam and Gajapati District between 5 to 7 acres (Schmidt 1993, p.43) or roughly at 0.4 bullocks per acre.

Economics of Draught Animals

Male cattle is yielding better returns compared to buffaloes but only because the later incur high costs of depreciation (Rs.458/-). In case of cattle bullocks the best returns are obtained by other castes, large farmers in highly irrigated areas what roughly can be referred to FS 1. For the male buffaloes no significant trend is emerging except that large farmers are getting the best returns.

The components of the variable costs are given in figure 19. For the moment, only the male bovines are of interest. The two main components of the variable costs are fodder and the costs for contract labour that is included in the operating overhead costs. The cost of male buffaloes are higher in both cases compared to the cattle bullocks.

Composition of variable costs (including contract labour and depreciation of assets) of livestock (Rs/adult animal). A clear trend that is emerging is that the variable costs are increasing with the land holding size because of extensive use of contract labour by the resource rich households. As it becomes visible from table - 27 the other castes have comparatively the highest variable costs due to the same reason.

It can be concluded that keeping of draught animals in most of the cases is resulting in a loss. Nevertheless the cultivators maintain them because they do not see any alternative to their power requirement. Particularly under rainfed conditions the aspect of the timeliness of the agricultural operations is an important factor that is considered by the farmers. They fear a reduction of the crop yields if any delay in the cultivation occurs because draught power is not available. In fact, many discussions with farmers revealed that during the agricultural peak season bullocks are hardly available on hire. On the other hand, under irrigated conditions a group of farmers stated categorically that a delay of two weeks in cultivation does not affect the yields nor the cropping pattern (Schmidt 1993, p.46). But, in any case, only a better utilisation of the capacity of the draught animals would improve their economics. This can only be achieved if the number of bullocks is reducing.

LIVESTOCK MARKETING IN GANJAM & GAJAPATI DISTRICTS

The development of animal husbandry requires a knowledge of the existing marketing systems of such kind. Considering this Indo-Swiss Project Orissa (ISPO), recommended a study on the livestock markets with special emphasis to the seasonal fluctuation on prices and number of traded animals, in and out flow of these animals into or out of the district.

Livestock markets are held weekly as a part of the "Hatta" where all kinds of goods are marketed to fulfill the household needs of rural people. There are 3 large markets (above 50,000 animals), 4 medium markets (above 15000 animals) and 5 small markets (below 15000 animals brought in a year) in the districts. Out of all the above markets only two are run by the Market Society

The use of drought power can not be replaced by conventional energy in a realistic future.



Pix Ghani Zaman for CPSW

(Hinjili and Parlakhemundi) and the rest are leased to a private entrepreneur on an annual basis. In the market direct selling is hardly found. Middlemen (290 are found) play an intermediary role between buyer and seller. They negotiate the price of animals and get a commission from both the parties. Besides this, there are also 188 licensed traders found in Hinjili market. These traders sell and buy the animals in a huge number.

During 1991-92 a total of 4.8 lakh animals that is 79% (79,500) of all male buffaloes and 55% (2,86,500) of all cattle bullocks were brought to the formal livestock markets in Ganjam and Gajapati Districts. Male bovines are represented in all the markets, whereas goats and sheep are found in 8 markets only, amounting to 65,000 small ruminants. 70% of them have been marketed to meet the meat demand of the urban population.

However, the sharp increase of animals bought are found in the year 1987-88. This is due to drought in the blocks of Chikiti, Digapahandi and Patrapur areas. During that period many farmers of these blocks could not cultivate their land and most of the farmers disposed of their animals. Similarly, there was heavy flood in the Ganjam District in 1990. Many animals died in the high flood. That is why, in that year a sharp decrease of animals brought to Hinjili market was observed.

Table - 12 : Proportion of animals marketed compared to their total population

Species	Total Population	Brought	Marketed	Share (%) of total population	Share (%) of total population
Cattle					
- Bullock	519146	286500	137520	33	48
- Cows	606268	34000	13940	2	41
Buffaloes					
- Male	102530	75900	34155	26	45
- Female	82770	16400	4115	4	25
Goats & Sheep	421929	65500	45200	11	69
Total	1732643	478300	234920		

The markets in the hilly tribal areas cover the meat demand of the local population. But in the plains where most of the people are Hindus (who do not touch beef), the bovines meant for slaughtering are brought from far away places. The prevailing demands of the beef industry at Calcutta is met by animals from Ganjam and Gajapati District too.

Livestock Markets are mainly for draught animals : The main function of animal markets in Ganjam and Gajapati districts is to fulfill the farmers demand for draught animals. This is evident since in most of the markets high proportions of cattle and buffalo bullocks are seen. The estimated number of marketed cattle bullocks is equal to 33% of the total bullock population and 26% in the case of male buffaloes. This means that around 86000 pairs of bullocks (cattle & buffaloes) are changing hands every year.

Traditionally, each farmer keeps a pair of bullocks to cultivate his land. Due to population growth the holdings get fragmented. The number of holdings increased from 270800 in 1970-71 to 356500 in 1985-86. Particularly the number of marginal holdings (less than one hectare) increased. Simultaneously the number of share croppers increased. These share croppers cultivate a small piece of land and decide from year to year whether they are going to do it or not. Hence they are potential buyers and sellers of draft animals.

Mechanisation of agricultural operations did not take place in Ganjam & Gajapati Districts on a wide range. In 1990 there were only around 500 tractors (Sources : Regional Transport Officer) in the two districts. Transportation of goods is still done to a large extent by using bullock carts. The district statistical handbook of 1990-91 mentions, that 60000 bullock carts are counted in Ganjam district.

An acute fodder scarcity in the plains of the two districts, partly caused by the decline of the common pastures, urges the farmers to dispose of their draft animals after the cultivation season and to purchase a new pair before the next season. To conclude, it can be said that there is no other way for share cropper and marginal farmers to purchase their draught animals if they want to be independent owners of them. Other possibilities to solve the problem would be to hire bullocks, share them or to get them on entrustment basis. All these possibilities are practised in Ganjam and Gajapati districts too.

Role of Small Ruminants in the Livestock Markets : To meet the meat demand of the urban population and in a limited extent for export to other districts/states small ruminants are brought to the weekly markets. Every year around 65000 goats and sheep are brought to the markets of Ganjam and Gajapati districts and more than 70% or 46000 were marketed during 1991. According to this source around 66000 small ruminants were slaughtered during 1990-91. It could be concluded that around 2/3 of them were sold in the markets while the remaining were purchased by middlemen in the villages.

Traders who are mostly SCs buy animals from different villages (mainly tribal villages) and sell it in the markets while Muslim traders buy animals in the markets as well as from villages through their agents.

Livestock Markets for Slaughtering Purpose : Every year around 28,000 large ruminants are sold for slaughtering purpose in the markets. These animals are mostly old, dry and weak. There is a slaughtering route where animals are driven from the plains to the hills where the local population is consuming beef. Besides this, animals for slaughtering are also sent outside the district and even outside the state. Since there is an export market for beef in Calcutta most of the animals are going there. However, this is an open secret among villagers. The marketing of these animals is done by the professional traders.

No Market for Female Bovines : Female bovines are hardly sold in the market. Only 6% of the total Female animals in the districts are brought to the markets. There is a limited demand for cows. That is why the price of these animals is not increasing in comparison to the male animals. There is no supply of crossbred bovines since a very small number (7000) are in Ganjam & Gajapati districts. Whatever is produced meets the demands of DRDA (District Rural Development Agency) beneficiaries. Last year 1200 cows were distributed under such scheme and this demand was partly met through authorised dealers and farmers of Parlakhemundi area.

PERMANENT PASTURE & OTHER GRAZING LAND : CONTROVERSIAL ISSUE

Pasture and grazing lands are crucial for livestock rearing, specially in case of landless and marginal land owning families.

In Orissa, the number of bovine population is not directly proportional to the area of permanent pastures and grazing lands, except the Phulbani and Mayurbhanj districts, where the bovine population is directly proportional to the area of grazing land.

A large part of area expansion under agriculture has taken place, at the expense of village forest and pastures. There are currently 9.54 million ha. of "wasteland" in Orissa which remain either under-utilized or unutilized. The rural poor in recent past depended on these 'wastelands', for their sustenance most of which were common property resources such as village forests and pastures.

Due to encroachment, degradation of grass lands, more lands coming under cultivation and other socio-economic use, in most parts of the state, availability of total grazing space has been greatly reduced. However, the data obtained from the District Statistical Handbooks (1989-90) shows a successive increase in permanent pasture and other grazing lands.

Table - 13 : Districtwise position of permanent Pasture & Other Grazing Lands

District	Permanent Pasture & other grazing land					
	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87
Puri	57	57	66	66	66	66
Kalahandi	20	41	20	20	20	24
Bolangir	40	40	58	58	58	58
Ganjam	38	38	38	38	38	38
Sundargarh	41	39	41	41	41	72
Sambalpur	70	70	95	95	95	95
Mayurbhanj	30	29	29	29	29	29
Phulbani	04	04	37	37	37	37
Dhenkanal	45	45	45	45	45	45
Keonjhar	38	38	38	38	38	38
Koraput	94	94	104	104	104	160
Balasore	24	26	24	24	24	26
Cuttack	28	38	23	23	23	23
	529	559	618	618	618	711

Source : District Statistical Handbooks - 1989-90.

But observations from different villages located in various geographical and environmental conditions reveals a different picture, altogether. The perceptional data obtained from villagers is presented in table - 14.



Encroachment of Grazing lands (common) have left nothing on the ground to graze !

Pix : Sanjay K. Khatua.

Table - 14: Existence of Cremation ground, Gochar, Anabadi, & other Common Lands

Villages	Total Area in Acres At present	20/25 years before	Remarks
Walipur,Gania block Nayagarh district	5.72	14.32	Intrusion of river Mahanadi
Mankadachuan,Bolangir block,Bolangir	136.00	196.00	Encroached by villagers
Karatanga,Binika block,Sambalpur	251.90	301.09	The Harijan families have encroached about 50 ac. of gocher land
Betanda,Derabisi, block, Kendrapada	25.32	55.00	Encroached by villagers
Kusduma,Chandabali block, Bhadrak	37.65	52.40	Encroached for cultivation
Kainsi,Keonjhar block, Keonjhar	274.94	312.73	Encroached for cultivation

Unequal Provision : Under the revenue system in Orissa there is provision for Gocher land for every village. In general, there is provision for reservation of 5% of the 'effective area' of a particular village, for grazing purposes. Since the 'effective area' is not always proportional to the population of the village, wide inequalities are observed in the quantity of grazing land and other common properties between different villages. Many villagers traditionally share their grazing land with neighbouring villages, without which these villages would have faced great difficulties. Villagers of Wallipur (Gania), Nakhara (Bhubaneswar), Berhampur (Kendrapara) etc. were found to be sharing the grazing lands of the nearby villages. This situation often triggered off inter-village conflicts.

Nothing to Graze : Sometimes the official gocher land is located at unsuitable places - water logged, hilly, saline tracts-that do not allow grass to grow. In Adhanga Mallikeshpur under Derabisi block in Kendrapada district, people face difficulties in using their 'gocher' land. For a major part of the year, it remains submerged under water and no grass grows.They also complained that repeated grazing in the muddy field made the soil hard, which limits sprouting of grass on it.There is also no approach road to the grazing land. This is the experience with many a village. Though there are statutory provisions for an approach road and it's development, seldom is there any programme to implement it.

REDUCED GRAZING SPACE : WIDE IMPLICATIONS

All these factors has resulted in general reduction of grazing space. The impact of this situation can be summarised as follows

:-Cattle go to the same places again and again. which further degrades the grass land.

-It requires more careful attention while taking out cattle for grazing and demands more manpower.

-Cattle frequent the roadsides and canal sides and chances of regeneration of saplings gets reduced.

-There is more pressure on stall feeding but there is an obvious constraint in this - as for the same set of reasons, collection of fodder has become difficult and production of crop residue has not increased in every village.

SEASONAL MIGRATION : ONLY ALTERNATIVE TO KEEP THE TRADITIONAL OCCUPATIONS GOING !

Shortage of grazing space and fodder has led the traditional livestock rears as to seasonally migrate to distant places, putting enormous pressure on the ecology of those areas. CPSW Village Environment Appraisal team during its field work had came across quite a few of these groups.

A ten member group of Gola and Gauda caste (traditional rearers) from Nayagrah area were sighted in the forest area of Tamajola,

Grazing on roads - as there is no land absolutely in irrigated areas.



Pix : Sanjay K. Khatua.

a Kondh village in Gania block (their villages are more than 50 kilometers away). They had a big herd of more than 2000 goats ('Lanka Chheli'). Usually they stayed with the herd throughout their travel and from place to place sell goats and milk to the local traders. This has been their traditional practice. But when they used to depend on their local forest areas, they did not have to travel to distant places. Now it is getting increasingly difficult to find suitable area for grazing which has forced many to reduce their herds. "If the forests go on vanishing at this rate we will be forced to loose our occupation" - reported their group leaders.

A large tract of Narasinghpur area (Cuttack district along river Mahanadi) now sports bald hills. This area was once famous for Buffalo milk and milk produce where a number of families of milk men caste used to have large herds of buffaloes. While many families were forced to wind up their traditional occupation due shortage of grazing space, many struggle to pull on & migrate to Badasilinga-Harabhanga forest areas across the river Mahanadi & other distant places. This put enormous pressure on the local vegetation.

Yet another area famous for milk products is the coastal Paradeep-Kujang-Patkura area where people used to have large 'Mainsigotha' (buffalo herds). Many had their own and leased in Palanda lands (grazing lands in and around the river bed). Due to pressure for agriculture lands many of these Palandas are either encroached or disputed. The near by mangrove areas which used to be the popular grazing fields of the local herders have been almost destroyed. Increased agricultural activity and encroachment of the traditional grazing land also adds to the problem. All these have put the local herder at the cross roads whether to keep or not to keep to their traditional occupation.

CPSW Village Environment Appraisal team had met a number of local herders of that area - Krushana Chandra Behera and Natabar Behera, of village Bedari of Patkura block in Kendrapara district are two among them. They have 37 herds of Buffaloes and 4 acres of Palanda land - which is enough for their herd to graze about 4 months. Reportedly, people are at present reluctant to allow grazing in their private lands. They are under the impression that buffalo urine is good for land, but the dung help increase salinity in soil. During summer season now they migrate up to 'Aul' (about 100 kms) along the water course and wet lands. Some local herds migrate to Dhenkanal area. This might not be possible in near future as the locals are bound to oppose them. Therefore, they seriously contemplate winding up and changing over to rearing Jersey cows.

Pastoral & Cattle Herd keeper : *Koyas* : Koyas are the principal tribe occupying the newly formed Malkangiri district. Those of them who live towards the north of Malkangiri, up to Mathili and Marye Kandha in the southern area are of a more primitive type than the southerners near Mottu who are greatly influenced by Telugus. Koya villages are situated on patches of clearings in the midst of forests. Yet Koyas often shift from one place to another in search of new land or for fear of super natural elements. Though Koyas are primarily shifting cultivators slowly adopting wet cultivation, cattle is the symbol of their wealth.

Godhana (Cattle Wealth) : In Koya society, 'chom' or wealth means cattle. According to tradition, a Koya has no status without cattle. Cattle is given to Koya -pita (bride's father) as kanya-suna (bride money). Cattle is slaughtered to provide meat which is eaten by the Koyas. Each Koya family owns a large herd of cows and buffaloes. There are families who own three to four hundreds of cattle. The nomadic life of the Koyas is gradually getting settled now. Resettlement of Bangladeshi refugees, land and grazing pressure is gradually reducing the animal population and changing their life styles too. (Source : Study on Commercial Plantation, specially Eucalyptus in the Tribal & Drought Prone areas of Orissa. CPSW, Bhubaneswar).

FODDER : CRUCIAL FOR LIVESTOCK REARING

Fodder availability is a critical aspect of livestock management in India.According to an estimate, the available fodder resources can meet only 50% of the demand (govt. of India,1986). Under such scarcity, most of the livestock will not be able to maintain their productivity and this resource, having potential to support millions of rural people, will turn into a liability.

Presently, the fodder production in the country falls much short of the requirement. The committee set up by the National Wasteland Development Board had estimated (in 1985), that there was a shortage of 339 million tonnes of dry fodder. The requirement in the year 2000 is estimated at 949 and 1136 million tonnes of dry and green fodder respectively.

Generally there is acute fodder shortage during the winter and summer due to drought. In western Orissa and in some of the Garhajat areas, due to drought people sell their cattle after the Kharif crop cultivation and buy them at the on set of the next agricultural season.

During 1987-88, due to continued drought, large scale cattle trafficking was reported from Haripur, Bhaliadarh, Soral, Hinjillikatu, Belguntha, Kanchili areas of Ganjam district. Reportedly, about 40 truck loads of cattle were transported to Calcutta markets every week, which also includes able bodied cattle. Acute fodder shortage & urgent need of cash were the major reasons. As is practice, prior to migrating to other areas for wage earning, the households first sell out their cattle & other livestock and many often find it difficult to buy them back to settle down to cultivation again. This is also the situation in all the drought prone pockets of Orissa. Groups of traders herding large herds of cattle, mainly for flesh markets is a common sight in Bolangir - Sambalpur highway in the winter and summer months.

Animal Feed : Varied Practice : Availability of animal feed is the most crucial thing which determines the choice, type and amount of livestock. Like the other parts of India, in Orissa the practice of feeding the animals varies, as per the availability of bio-resources, cropping intensity and work load in the household.

Livestock is fed on different feed, including grass, tree leaves, agricultural residues and cultivated green fodder. The popular feeding practice in Orissa is 'Torani' - the left over food stuff, vegetable peels etc. are put in to a 'Gorukunda' - which the households usually have in their courtyard - this is left to ferment - a small amount is taken every day and fed to cattle with water and husk. During the rainy season, this is sometimes given hot. In rural areas, there is no concept of a 'balanced diet' for an optimum fodder mix' for the animals and consumption generally depends on the availability of different materials in different seasons.

"Most of the animals are fed with whatever crop residues are available and then left to try wastelands, and forests. Nine out of ten animals in the country subsist on this kind of potluck and still go hungry".

The main feeding systems in the state are based on various combinations - crop residues and stubble cut, fodder grazing on community lands and other grass lands, including strips along roads, canals, railways and along field margins, grazing inside forests and along forest margin, leaf fodder by way of lopping and browsing, cultivated green fodder. Concentrates are also commonly used as an addition to the normal feed of livestock especially in cases of hybrid cows.

Feeding Practices : Local Variation : In the areas where dependency on agriculture is greater (plain irrigated areas), animals are both grazed and house fed. Depending upon the distance of the water sources, they are either given water at home, or at the open water bodies, in and around the villages. In these areas, the animal feed mostly consists of a varieties of crop residues, such as hay, straw, residues of pulses, husks, green leaves of sugar cane, paddy, etc. Some are given as roughage and other as prepared food, a mixture of water, husk and shredded roughage etc. Collected green fodder is also given at home.

In unirrigated areas, close to forest villages, where agricultural activities are not that intensive, home feeding (mostly bullocks) is usually limited to the cultivation season. Cattle are mostly left to graze in the forest. They are even expected to have their quota of water at the open water bodies. In some areas, in the summer season, the cattle even do not return home. For a major part of the season, they stray in the forest. The animals are most unfortunate in the areas having negligible agricultural activities and degraded vegetation. Except in the cultivation and harvesting season, the cattle are let to fend for themselves.

In Adhanga Mallikeshpur, (irrigated, Derabisi block, Kendrapada district) the villagers report that over the years, there have been great changes in availability of fodder and the practice of animal feed. The reasons forwarded by them are :

- A Few years ago, pulses like horsegram, 'chana' and ragi were cultivated abundantly. People used to get huge quantities of crop residues from these crops, which did not have any use, other than animal feed. They used to prepare a porridge locally called 'Jau', which was especially given to cattle in the rainy and winter seasons.

-Fallow and uncultivated lands have come under cultivation (owing to irrigation and significant improvement in water logging, due to drainage cuts).

-Encroachment of traditional grazing lands.

- Most of the paddy are now transplanted, so chances of feeding animals by top cutting is limited.

- Literacy in general has increased and so also the school dropouts. The children, especially from small farmer families, do not prefer to go for cutting grass, or take out the cattle for grazing. In general, people have become mobile and except during the rainy season (cultivation season) going for grass cutting is not preferred by people. It is mostly the old parents who take care of the livestock.

- Production of straw has increased but this does not influence the cattle feed much, as first priority goes for thatching. Previously many of the households neglected thatching.

In case of Karatanga (Binika block, Subarnapur district) where production of straw has increased manifold due to increase in the summer paddy, it does not contribute much to cease the burden for thatching, or providing cattle feed. Cattle do not prefer the fertilizer and pesticide enriched straw. Nor do farmers prefer them, as these are of very poor quality to withstand the rain.

Intensively cropped village, Batanda in Rasulpur block of newly formed Jajpur district, has a different trend. Here the change in the cropping pattern, cropping intensity,and almost total encroachment of village commons and population density, have made people rear cattle specially for income generation.

Farmers here, have recently tested the benefits of cash crops and use high doses of fertilizers. Their fields, earlier enriched by nutrient rich sediments of the flood waters of the Brahmani, have cash crops like groundnut, sugarcane and varieties of vegetables. Huge amounts of grass grows by the side of the demarcation lines and elsewhere in the fields providing fodder for cattle.

Livestock Grazing : Victim of many Changes : The single most important factor, which influences the grazing as well as the feeding at the household level, is the ratio between the cultivated land and the cropping intensity. In all parts of Orissa, the amount of agricultural land per village has registered an increase, at the cost of encroachment of village commons. Change in cropping pattern and cropping intensity has severely limited grazing in agricultural lands, during the post harvest period. Climatic change also affect the generation of grass.

An Oriya proverb says, ***"Megha Chaitimata Kala, Gauda Gai Duhin Mala"***, - which means that if it rains in the month of Chaitra, (Feb./March), - grass grows abundantly and the 'milkmen' get tired of milching the cows, as they give huge amounts



Pix : Sanjay K. Khatua.

After use of straw in house repair etc., not enough is left for cattle feed which is the main source of fodder.

of milk after eating the newly spouted grass. But in spring rain is not experienced in many areas at present.

Due to delayed rainfall and other reasons, direct casting of paddy cultivation has been greatly reduced and more land is being transplanted. Directly casted paddy, locally called 'Bua' is used to provide enough fodder during the months of August/September/October. The growth is so much that it necessitates cutting the top or letting the cattle graze, in order to contain the growth and help in cropping.

Waste Lands Under Constant Degradation : Villages located near protected forest or having vast 'wastelands' around their village, also experience the scarcity of fodder. Except the coastal districts, in other parts of Orissa, a large percentage of villages have huge amounts of wastelands around them. But due to soil erosion and other reasons, they are in such a degraded state that no grass grows there. In some cases, these lands were used for social forestry, in order to make fuel and fodder available to the villagers. But this has not been possible, even in cases where trees have survived, due to selection of non browsable varieties and due to unrestricted sweeping of plantation floors, for collection of dry leaves for fuel. During field observations in Ranipur Jharial (Bolangir), Khurda area (Bhubaneswar), the CPSW Village Environment Appraisal team, found vast 'wastelands' around the villages not having a single blade of grass.

Though people have successfully protected large tracts of forest and plantations, they do not get much fodder, as undergrowth is severely affected by repeated 'sweeping', for leaf collection.

Tribal Areas : Need Special Attention : Due to degradation of forests, there is a great dearth of grass and fodder in the tribal areas. Undulating topography and low retentivity of water in hill slopes make it difficult for grass to grow. Cattle, goats and sheep find it hard to get a good grazing. Even branches of such trees which can be used as fodder are vanishing day by day.

Along with the horticultural attempt, it may also be necessary to encourage appropriate planting of grass and fodder trees, otherwise the tribal areas, which have been dependent on forested area for animal grazing may find it hard to rear animals.

The cultivated areas in the tribal districts are mostly monocropped with a single crop paddy during Kharif season. The tribals do not grow any fodder crop. But they grow maize and millets in the high land close to their habitats. Some tribals can take up cultivation of fodder. Besides, they can be encouraged to grow barbati, barseem, etc. In course of development of vegetation, some of the waste land can be developed for fodder.

FODDER BOOM : NEW AVENUE FOR INCOME GENERATION FOR THE POOR

In the village about 40 percent of the households including landless and land owing people, have started rearing male calves. A male calf (baby ox) is purchased for Rs.800/-. After one year or so, it is sold for more than Rs.1800/-. These oxen grow well on tender green grass. The land owners, share croppers and the encroachers, get huge quantity of tender green fodder from their groundnut, sugarcane and vegetable fields. The landless are also benefited, as they collect fodder from the fields of others, with permission.

During late winter and summer, grass is collected through scraping the roadsides and fields by a special tool, 'Khurupi'. It is the children (majority of them being girls) and the aged persons, who shoulder almost all the responsibilities of ox rearing. This occupation suits the small scale farmers as they do all the ploughing with baby oxen. In the process, the oxen are fully trained, fetching good prices



Pix : Sanjay K. Khatua.

Poor children are clearing grass for sale. Fodder production can provide income to poor families.

This, however, suffers from two demerits, (1) the incidence of dropouts and children of school-going age who do not attend school has increased in economically poor families, (2) large scale scraping accelerates soil erosion and threatens the regeneration of grass.

Narendra Das, 12 year old, has never been to school. He collects all the fodder for cattle, while his father cultivates sugarcane and vegetable on share cropping basis in 0.12 acre of land.

The future that this practice can take is perhaps seen in the case of another village. Karatanga in Binika block of the newly formed Subarnapur district, located at the tailend of one of the first generation canal systems of Hirakud dam is an intensively cropped area, with special attention to high yielding summer paddy. Here the farmers have reached the point where, to maintain the production rate, they now apply increasingly heavier doses of chemical inputs. This is stated to be the reason for sharp decline of fish, varieties of edible greens and grass. Almost all the available land have been used for cultivation. To add to the plight, the straw of the high yielding paddy cultivated with heavy doses of chemical inputs, is not palatable to the cattle.

In both the cases, it is the landless who suffer the most. Small scale livestock rearing for cash income, has become very difficult. It requires too much manpower to either take them for grazing to distant places, or to collect fodder.

Fodder Banks : The 8th Plan focuses on the establishment of fodder banks in drought prone areas. Under the scheme, vacant lands would be developed for grass cultivation and the harvested lot would be preserved in fodder banks. Intensification of technology transfer from the research institutes to the farmers is one of the priority areas. These research organisations would help the state Govt. in drawing up specific schemes of fodder development. Presently, many organisations and agencies are involved in the planning and implementation of fodder development programmes at the State and National level. Effective coordination among various agencies involved in the planning and implementation of fodder development activities has been envisaged in the 8th plan.

The main thrust would be on the establishment of a Central Coordinating Agency for feed and fodder resources and fodder seed production. At present seven regional agencies are operating in the country. These institutions have proved very effective in assisting the State in introducing high yielding nutritious fodder crops under existing farming systems, increasing the production of fodder seeds and carrying out training and demonstration activities.

Movement Towards Forest Villages : Though restriction on grazing in forest areas, is not that strictly enforced in many parts of Orissa, yet, villages close to forests are not free from troubles. Due to scarcity of fodder and grazing areas in the plains, distant to forest villages, livestock are herdedto the 'village forest' nearby. As a result, crops near these villages are destroyed, regeneration of plants is severely affected and many grass species used for raw material to make baskets and brooms have also disappeared.

While conducting field observations, the CPSW Village Environment Appraisal team came across such cases in Barapadar, Dumerguda area of Kentamal block in Phulbani district. People narrated their plight - livestock from about 20-25 villages passing through their village area, on their way to 'Lakh Parbat' forest, destroying their forest resources and plantations (developed with the help of a local NGO 'SHED').

Hire of forests, especially in summer months, for Kendu leaf collection, destroys the rich fodder base in the village forest areas. In a period when the need of the fodder is greater the villages in Baisipalli area of Dasapalla, Harabhanga forest tracts, though located inside the not so degraded forest area possess few livestock (till it rains), as the forests are put under hire, to get a better kendu leaf harvest.

DRINKING WATER : PROBLEM FOR ANIMALS

The other major problem associated with open grazing and experienced by villagers in many parts of Orissa, is water scarcity in the summer months. Due to lack of renovation and siltation, the traditional livestock watering spots, on the outskirts of villages, dry out in summer. Since collection of drinking water itself becomes a problem, the cattle are left thirsty, or forced to drink the muddy water. In Ganjam district innumerable 'Katas' serve as watering points for animals.

SUGGESTIONS FOR SUSTAINABLE LIVESTOCK DEVELOPMENT

In the process of CPSW Village Environment Appraisal, many valuable suggestions regarding the problems faced in livestock rearing emerged in group discussions :

- Almost all the villages have some amount of roads, canal/ river/ pond embankments, drainage cuts, large water bodies etc. within their revenue jurisdiction. These lands should be used for fodder generation, through the collaboration of villagers. The time has come, to seriously consider the potential of these unconventional lands, as for various practical constraints, it might not be possible for the villagers to free encroached grazing lands.

- People can increase the production of crop residue, through careful harvesting and storage (a lot is wasted in these process). Provision of alternative fuels can also save substantial amounts of crop residues, for animal feeding.

- Every household has some amount of fence area. Fodder generating trees can be planted on these fences. The sides of the fence should be used for cultivation of various grass species, leaving the rest of the area, for other routine use of the households.

- People are not aware about fodder production, from the traditional grazing lands. While discussing with the people, they agreed that they have never thought of the total potential of grazing land available, within the revenue jurisdiction of their village. Traditionally, the entire livestock of a village, hamlet or pada used to frequent particular grazing fields, resulting in over stocking and unequal access to bio-resources. The fodder situation can be improved to a great extent, if grazing by rotation, can be introduced for particular hamlets/ padas, utilizing the entire potential of grazing available in different seasons.

GRAZING ROTATIONS : TRADITIONAL SYSTEM

Previously, many villages had an informal grazing rotation system, called 'gai pali' and there were traditional herdsman, 'palia', 'naria', 'charua' as they are known in different parts of Orissa. They used to give their services in exchange of 'bartan'- a fixed amount of cash/kind per head of animal. 'Uduan' - open grazing was allowed from 'Makar' to 'Raja' - January to June. However, in many areas, especially on the coast this system has been abandoned, as it became difficult to control the cattle, within the restricted grazing space, with standing crops around, during most of the year. Many could not afford the 'Charuas' for small herds. Many families have neither the manpower, nor the inclination, to take their own livestock for grazing.

CATTLE WORSHIP : DYING TRADITION

To increase fertility, to invoke & appease various spirits, to protect crop from pests, animals etc., and just to celebrate the harvest, various festivals are celebrated in Orissa throughout the year. The festivals associated with the wellbeing of the cattle in Orissa are Rakhi Utsav or Gamha Purnima. Gamhapunei falls in the month of Shravan, the month of torrential rains in Orissa.

On these day cowsheds are cleaned and various motifs are painted on walls in rice powder paste. The livestock are applied with oil and turmeric and are given a good bath. The cattle, especially, the plough and cattle, are worshiped as Lakshmi in the form of cattle (Go-Lakshmi) after being colourfully decorated and offered special food. This is the rest day for cattle. This festival is analogous to the Sohrao festival of the Santal, Ho and Munda tribal people when they also decorate the cattle and worship in the cow-shed. Many other tribals in Orissa also observe Gamhapunei.

REDUCTION IN LIVESTOCK LIMITED GRAZING - STALL FEEDING : ONLY ALTERNA-

Considering the grazing problem and lack of manpower, during informal discussions, many villagers suggested reduction of animal heads and stall feeding, as future alternatives. As in some cases, it is important that the households reduce the number of livestock. It is also equally important to create an atmosphere, so that needy families who would like to supplement their income, can keep animals. Several factors favour stall feeding. It would increase dung production, help in regeneration of fodder, enhance milk production, involve less manpower etc.

While it might be possible to reap all these benefits, stall feeding does not appear to be free of problems. Observations in six coastal district villages revealed that about 13 percent of the households do not have separate cattlesheds and animals are accommodated inside the living house. In the rest of the cases who have separate cattlesheds, the per animal living space (taking into consideration the cattle and small animals), is found to be a mere 26 square feet. Most of the cattlesheds have a mud floor. The limited living space and mud floor necessitates keeping livestock in the open, which in most of the cases is the front of the houses on both the sides of a narrow village street. Many villagers sharply reacted to the idea of stall feeding as it would "create a hell of these places" (the streets). This seems to be the truth, considering the mess in the village streets. It is also feared that stall feeding would further increase the household level workload of already overworked women.

However, many people agreed that if the number of livestock is reduced, stall feeding and limited grazing is the best compromise. In many areas in the environment conscious villages, people have already initiated attempts to reduce livestock, through unanimous village resolutions. 'Brukshya O Jeebar Bandhu', an NGO active in Nayagarh area, is propagating the idea of having limited livestock in their operational area.

A lot of promise can be brought back to livestock rearing, if villagers can be made to take the initiative. Take the case of Nembara, a village having more than 1200 residents in coastal Marshaghai block, in Kendrapada district, with about 2 kms of branch canal within it's revenue jurisdiction. A few years back, villagers, through a resolution restricted grazing and fodder collection in all forms, from both sides of the canal embankment. They also sowed black gram on the embankments. The restriction of livestock helped in dramatic growth of assorted varieties of fodder, which were partly auctioned to households and groups of households were assigned to particular reaches to harvest fodder. Above all the village fund got some income out of the sale of black gram.

SHIFT TO STALL FEEDING : ENTAILS GREAT CHANGE IN PRACTICE

Considering the fact that a negligible percentage of animals are 'only stall fed', this would require a major change in practice as well as augmentation of produced bio-resources in order to shift to mostly stall fed rearing practices. In Orissa depending upon the feeding practices, the animals are classified into three board categories : only grazed, only stall fed, both grazed and stall fed. About 74 per cent of the animals are both grazed and stall fed. See table - 15.

TABLE - 15 : DISTRIBUTION OF ANIMALS AS PER FEEDING HABIT

Season	Only	Only grazed stall fed	Both grazing and stall fed
Summer	14.15	1.20	74.65
Rainy	26.75	1.00	72.25
Winter	23.92	1.20	74.88
Overall	24.94	1.10	73.96

Source : Survey Report from Animal Husbandry (1987-88).

Nomadic cattle herding practice in Orissa. In this case, Buffalo keepers from coastal areas are migrating to Dhenkanal district in seasons.



Pix : Sanjay K. Khatua.

On one hand, the requirement and supply of fodder in the country has caused overgrazing and on the other, it has left livestock to suffer from malnutrition, resulting in sub-optimum level of animal production.

FODDER PRODUCTION : AMBITIOUS PLAN

Green fodder production is yet to receive due attention. The state had 3 fodder farms in the sixth plan and another three farms were established during the Seventh Plan, raising annual seed production from 282 quintals in the Sixth Plan to 470 quintals in the Seventh Plan. During the 8th plan period Government plans to intensify 'fodder development and farmers' training'. The objective is to link dairy development, to fodder farming and milk marketing, through societies. Quality fodder seeds are the basic input for fodder farming. The seven fodder seed production farms in the state are producing quality fodder seeds and roots for distribution to farmers".

"For supplying an additional fodder requirement of 4 lakh cross-breed cows by the end of 8th plan, it is required to step up the seed production to about 1,000 quintals and 100 lakh roots and sleeves. The seed production capacity of the farms will have to be enhanced to meet the requirement. In addition, the method of enrichment of paddy stray and other agricultural wastes to convert it to better quality cattle feed would be emphasized. A scheme of about two crore rupees has been formulated to achieve this objective which will support the massive dairy development programmes to be taken up".

Focus on High Yielding Varieties : The Indian Grassland Fodder Research Institute (IGFRI), Jhansi, has done a good amount of research to improve fodder production. Green lands in the tropics are generally low in quality and the introduction of legumes such as Siratro, Atylosia and Stylo have been found to increase the protein content of the herbage, from two to seven percent. Reseeding of grass land with the improved strains of Bothriochola, using good management practices, has also shown promise, of raising production in natural grass lands. By bush cleaning and protection alone, the productivity of grazing lands may be increased two or three times. Grass land studies show, that nearly one and a half times the number of animals can be sustained, if the grazing is carried out by the deferred rotation system, instead of the constant and continuous grazing system.

Animal keeping : Shed, drinking water, bathing, disease control are also important factors related to their environment.



Pix : Sanjay K. Khatua.

In recent years research work at the institute has been intensified, to develop the concept of silvipastoral system on wastelands. Identification of species and forages suitable for various agroclimatic zones has been in progress. Experiments have shown that fodder production under dry land conditions, can be raised from 10-15 t/ha. to about 100-120 t/ha. green fodder. In most rainfed areas, woody perennials (shrubs/trees) of multiple use nature, have scope for incorporation in the crop production systems. Species like Leucaena Leucocephala under the alley cropping system (two metres spaced hedge rows), have produced annually 7.8 t/ha. of dry nutritious forage and every three years 8 to 9 t/ha. of firewood, without interfering with crop yield. General short rotation woody perennials, L.leucocephala (Sububul), Calliandra Calothyrus, Acacia Mangium, A.labida, Seshbania grandiflora, S.Sesban woody and Cajanus Cajan to optimise the yield of such systems, have been identified. The leaves of these species, added to the soil, improve the soil structure and nitrogen content of soil.

One of the major components determining popularisation and spread of fodder crops, is the availability of adequate quantities of seeds. But these crops are usually shy seeders and hence adequate availability of seeds is a problem. "The excess green fodder may be conserved for use during the lean period, either by hay making, or by silage making. For silage making, sorghum, rapier hybrid, maize, cowpea, stylo, oats, berseem and paragrass, have been found suitable. The institute has worked out efficient methods for hay making even in the rainy season.

Research in protein rich, environment friendly alternatives, has also achieved substantial breakthrough - 'Subabul Biscuit' is the product of such an effort. (The Hindu Survey of Indian Agriculture, 1989).

SUBABUL BISCUIT : BOOST MILK YIELD

Nutritious biscuits made from the leaves of the first growing fodder tree Subabul (leucaena leucocephala), can be fed to cattle and milk yields can be increased, say animal husbandry and social forestry experts. Subabul, which originated in Central America, is now grown widely as a fodder crop in India.

Subabul biscuit production was initiated on a small scale, in a few districts in Tamilnadu. A factory has been set up in Sengipatti village in Thanjavur district to produce these biscuits. Subabul leaves are ground and mixed with molases and bone meal, to produce biscuits. Prosapis pods & rice bran are also added, to enhance the nutritive value of the feed. Trials with milch cattle & buffaloes showed that biscuits enhance milk production. The Subabul biscuit idea is yet to catch on in a big way. Scientists at the Indian Grass land and Fodder Research Institute (IGFRI) at Jhansi say, that Subabul fodder is very palatable and nutritious and its wood produces useful timber. Subabul cultivation would be particularly appropriate for marginal farmers, who do not have access to large land holdings for fodder grass cultivation. (Source : Down to Earth, December 31, 1992)

LACK OF INNOVATION

However, all these ambitious plans have not been able to make any tangible impact on the situation of fodder availability. It is mostly confined to celebration of 'fodder week' and distribution of few thousand ',minikits' every year. Instead of attaching importance to fodder cultivation for the high bred cows, it should address the general fodder need, development of the existing grazing lands, production of fodder from other 'unconventional' lands having public accessibility, improvement in crop residue harvesting and enrichment. The programme necessitates implementation in such a way that it also benefits the landless, small and marginal farmers who have obvious limitations in bioresource production. Lack of nutrition leading to high mortality of livestock, low pregnancy rates and subsequent low rate in milk production.

Alternative natural resource management system, for the potential land available within the revenue jurisdiction of a particular village, should be created, in collaboration with the villagers, granting equitable distribution in particular, to landless and marginal grazers. Wherever innovative steps in this regard are taken by the villagers, they should be supported and encouraged.

ADEQUATE & APPROPRIATE BUDGETARY PROVISIONS

An analysis of the budget 1992-93 of the AHD reveals that 76% of the planned expenditure fall under "Non plan expenditure", which is meant to cover recurring costs like salaries, establishment expenditure (vehicles), medicines and equipment. 90% of the Non-plan expenditures are eaten up by salaries ! 23% of the overall budget is foreseen for plan expenditure like new schemes. The remaining one percent is met by centrally sponsored schemes like control of Foot and Mouth Disease or Development of Indigenous Breeds. At present, two externally aided projects are running in the state, the Integrated Livestock Development Project in Koraput with the support of the Danish International Development Assistance and ISPO. In figure 9 the budgeted expenditure of the AHD is split into activities of the AHD.

Anti Poverty Schemes : Credits for dairy animals are sanctioned under the IRDP scheme exclusively meant for the resource poor. One farmer gets 2 dairy animals within a time span of half a year. CENDERET 1993 remarked that due to lack of working capital and knowledge in management practices they have not been able to generate income and consequently in a majority of the cases the scheme has failed. Bungling found at various levels was also responsible for the failure of this scheme. An additional constraint is that good quality CB cows or heifers are hardly available and if available they are imported from Andhra pradesh. In the case of marginal and small Goudas CENDERET found successful examples of the IRDP scheme too & large farmers can receive bank loans directly (CENDERET 1993).

Experience of Livestock Related Anti-poverty Schemes

Many rural households, especially the target beneficiaries under various poverty alleviation programmes, who are encouraged and given assistance for rearing livestock, do not have the necessary infrastructure, skills, ability and access to bio-resources required to make it a cost efficient occupation. The climatic and environment condition plays a major role in rearing exotic breeds. These factors do not appear to have been taken seriously by the implementing agencies. Babu Pradhan, the cowherd man of Teliapada Sarsahi of Tangi block in Cuttack district got 6 goats, of some exotic variety under one of the poverty alleviation programme, but all died within 10-12 days. Not only goats, but innumerable beneficiaries have similar experience with cross bred cows.

Entails More Co-ordination : In the fodder development programme, proper & functional understanding should be created between various departments, who control various types of land within the revenue jurisdiction of a particular village or otherwise associated with development programmes - forest, agriculture, irrigation, revenue, horticulture, soil conservation etc.

Due to the deterioration of grazing lands and forest areas, with the increasing animal population and continuous and constant grazing, forage availability is declining while the requirement is likely to increase. This gap between demand and supply will continue to widen, if fodder production is not increased. Management of common lands for developing grazing resources is one of the key issues, yet to draw any serious attention. In many cases, these 'common lands' involve delicate land ownership and management problems and hence lack political will power.

As it might not be possible to increase the existing grazing lands, there is the need to raise the productivity of the grass lands. Regeneration of village 'gochar' lands is technically possible, as natural grass could revive under protection. It is the social problem of overgrazing, that can be tackled by effective grazing rotation and through raising the awareness of the villagers.

The solution to the bio-resource problem related to livestock rearing, lies in an appropriate and integrated land-use plan. Social forestry programmes in arid and semi arid areas should be based on fuel and fodder species, as opposed to the present preference for non-browsable species. Sweeping of the ground of the plantations, and protected forest areas should be discouraged, in order to help the undergrowth.

PUBLIC GRAZING ON PRIVATE LANDS

Public grazing on private crop lands after the harvest, is an important informal arrangement helping grazers. This provides better forage than the pastures and uncultivated lands, re-sprouting of harvested crops, crop left over, etc. The immense potential of these private lands used for 'common purposes' can be exploited, through systematic development of these lands, by planting of fuel, fodder species on demarcation lines and production of seasonal fodder species, during the post harvest period. Production of crop residues can be enhanced, through increasing crop production, in vast amounts of marginal land.

It has been possible for many to still maintain livestock, only because of the present system of common grazing and watering at common water bodies. But many such waterbodies have disappeared due to siltation and encroached cultivation. The role of these waterbodies needs tobe understood and developed, as an integral part of the 'animal husbandry' programme. If an atmosphere of minimum bio-resource affluency can be created, with limited livestock and stall feeding, it could lead to better production. If animals are stall fed and fodder is cut and carried to them, the carrying capacity of grazing land increases. It can also increase the dung collection. However, to make the 'limited livestock' profitable, their quality needs to be improved while the 'poor accommodation facilities of livestock', needs to be improved, to allow stall feeding.

NEED FOR A COMPREHENSIVE GRAZING POLICY

Overgrazing has become an ecological menace today. Continuous selective grazing by animals causes palatable and nutritious grass to be replaced, by less palatable and inferior ones. Areas are reported to have been invaded by many unwanted bushes and weeds. Damage is also caused due to trampling of soil by the grazing cattle, which not only kills young vegetation, but also reduces soil aeration. The size and status of grass lands in the rural Orissa have become very degraded and present biotic pressures have not given any opportunity for grasslands to recuperate and rise to higher productivity levels.

Chemical Fertiliser used straw is not liked by animals nor found good for house thatching. Only the quantity has increased.



Pix : Sanjay K. Khatua.

There are no institutional means to regulate the use of the common lands. People tend to over-exploit them without any restriction. Prior to land reform, the animal grazer had to pay in cash or kind. After land reforms, no payment was needed.

A comprehensive grazing policy, in accordance with the various forest policies of the country needs a close attention. Free & uncontrolled grazing, by way of rights and concessions, have cost the environment greatly.

A grazing policy has to be evolved to deal with issues like grazing fees, rotational grazing, forest protection, the problem of migratory grazing etc. In fact, grazing should be an essential concern in, and as important input to, the planned energy development of the country. Research and development in the field of fodder cultivation with agricultural crop cultivation, also requires adequate emphasis. Forage crops do not find an important place in crop rotation, because of small holdings. Considering the small holdings, all the regional stations aim to incorpórate fodder, particularly legumes, into existing crop rotations. Seeds of high yielding variety of fodder crops, now available for each region, are supplied by regional stations. Silvi pastoral experiments have indicated that fodder-cum-fuel trees, like leucaena, grasses and legumes, can play a vital róle in improving production of forage, fuel and grain.

UNTIMELY DEATH : A GREAT LOSS OF ASSETS

For the purpose of meat, the animals are slaughthed in registered and unregistered slaughter houses and also private butcher establishments of the state where a sizable number of animals are being slaughtered which often includes able bodied cattle owing to distress sale in drought and fodder shortage situation. The species wise estimated number of animals slaughtered in different seasons during the year 1987-88 is as follows :

Table - 16

Seasons	Sheep	Goat	Pig	Cattle	Total
Summer	2,20,352	3,54,451	3,270	7,215	5,85,288
Rainy	1,74,517	2,54,914	5,222	11,210	4,45,862
Winter	2,30,146	3,53,892	4,467	12,369	6,01,874
Total	6,25,015	9,63,257	13,958	30,794	16,33,024

Source : Survey report, 1987-88 Animal Husbandry, Orissa.

The most horrible part of the buffalo story is the slaughter system, which is not only brutal and barbaric, but also wasteful. Hundreds of crores of rupees are lost and unimaginable agony is being inflicted on buffaloes, with no corresponding gain to man. 130 million small and large animals are killed in 3,000 municipal abattoirs, and in thousands of illegal locations in dilapidated dingy buildings, built in the earlier years of this century.

Buffaloes are made to trek hundreds of miles to distant slaughter houses without water, food or rest en-route. Besides being a traffic hazard, a few kilos of meat is lost in transit. When transported in trucks, the nose ropes are tied to the roofs so that the buffaloes remain standing throughout their last journey. Underneath the adults, the younger ones are stacked in order to save on freight costs. Many die in such terrible conditions. Slaughter methods are primitive and crude. Their legs are broken and they are thrown down on the floor by rough handling. In some large abattoirs, the front leg of young calves are broken and swung around the necks just to restrain them from following the adult buffaloes to the

slaughter platform. Often they wallow for hours in pools of blood and carcass wastes. In metropolitan abattoirs, 1000 to 3000 buffaloes are killed per day, all in one congested hall. The meat produced thus, is contaminated with dung, urine and carcass wastes. All these gory methods can be eliminated, at relatively little cost.

Amongst the many steps which can be taken, stunning should be introduced in order to avoid painful deaths and also to facilitate easy handling and bleeding. Incidentally, nine major injunctions given in the Holy Koran for the 'halal' method now being violated can be implemented by adopting stunnig. Transportation of animals in well-designed trucks would reduce shrinkage and wastage. Providing abundant water, use of sharp knives and ensuring that animals do not witness the slaughter of other animals are some of the important steps towards modernisation. Effluent treatment plants will eliminate pollution of the environment and use of by-products will generate additional income, which itself will pay for a part of the cost of modernisation. It is time for the Govt. to take the necessary steps to improve the conditions in which buffaloes are nurtured, kept and slaughtered so that a better quality of life will ensure better returns. (Prof. N.S.Ramaswamy, former head of the Indian Institute of Management Bangalore, Indian Express, 29,01,1989. Delhi Edition).

Improved Plough & Cart Technology : The traditional plough and carts are so inefficient that most of the buffaloes draught power at present goes waste. In order to goad them into hauling loads beyond their normal capacity, the animals are whipped and beaten. The rough yoke injures their necks, causing cancer. A better harness would eliminate suffering and give a longer life span to draught buffaloes. By using improved design of ploughs and carts, productivity can be trebled, thereby reducing effort and drudgery for man and animal alike. In areas of Haryana and Punjab, for instance, improved carts have led to prosperity to cart operators and farmers.

EMBRYO TRANSFER

Embryo Transfer (ET) is also being experimented to propagate cows having genes of the elite parents by the Department of Biotechnology (DBT). Recently a single elite cow became the mother of eleven identical calves in one year in a landmark achievement by Dairy Scientists using the Embryo Transfer technology, Under a scheme sponsored by the department of biotechnology (DBT). Scientists of the DBT's ET centre at Sabaramati Ashram Gaushals in Kheda district in Gujarat, performed this feat of delivering 11 calves from a single cow, making a world record.

Scientists artificially inseminated a Holstein crossbreed cow with a daily yield of 20 liters of milk with semen from an elite bull using hormonal injections super-ovulated the cow to produce as many as 15 embryos. The embryos were flushed out and implanted into the womb of foster mothers. Out of 15 cows, 11 delivered health identical calves, all carrying the genes of the elite parents. DBT sources say that ET technology which has now been standardised for cows and buffaloes has the potential of causing a revolution in milk production in five years. ET programme had been handed over to the Dairy Technology Mission under the National Dairy Development Board with DBT concentrating on "Upstream" technologies like embryo - sexing and embryo splitting.

ET is now available in Orissa in a limited scale through the co-operative societies. One ET sub-centre has been made operational at the OMFED training and orientation centre under a NDDB sponsored programme. (Source : Indian Express - 03.10.1992. Delhi Edition).

CATTLE REARING : GOING HITECH

Cattle Growth Hormone : A proposal by the National Dairy Development Board (NDDB) to import Bovine Somatotropin (BST), a synthetic growth hormone for cattle, has run into problems. The NDDB have planned to import 600,000 doses of BST, but the Indian Council for Agricultural Research (ICAR) officials insist initial import be limited to experimental quantities as it is not wise that a new chemical be imported and used on such a large scale without first verifying its suitability to India. Bovine growth hormone (BGH) which is produced in minute quantities in a cow's pituitary gland, controls cellular functions and stimulates bone and muscle growth, food intake and milk production. BST, it's synthetic equivalent, is produced from genetically engineered bacteria. BST, manufactured worldwide by Monsanto, American Cyanamid, Eli Lilly and Upjohn, has certain drawbacks. High dosages of BST administered during laboratory tests cause mastitis (udder inflammation), injection syndrome (inflammation and necrotic tissue) and affects the animal's reproductive organs.

However, BST use is permitted in many third world countries, including Mexico, Egypt, and Brazil, and Monsanto, based in Canada, is reportedly donating 100,000 doses of slow release (14-day) BGH to the Commonwealth of Independent states. Two years ago, the Rural Advancement Fund International, a Canadian NGO, reported instances of BGH being marketed in the third world because its sale was opposed in the US and Europe.

In India, Bharatiya Agro-Industries Foundation (BAIF) President, Manibhai Desai objects to any hormone being injected directly into the milk and then into humans. The milk could be boiled or pasteurized in a bid to eliminate side effects, but this is not always done. In Denmark, for instance, many girls attained puberty at an early age because of hormonal imbalance resulting from drinking unboiled milk containing BST.

ICAR officials maintain that if hormones are to be used at all, the usage should be indirect, using implements in the cow's ear, which takes up to one week to act. (- Down to Earth, November 30, 1992).

Obtaining expert veterinary services, medicines and vaccines and emergency facilities at the door step is still a distant dream to the farmers.

Over-grazing should consider the carrying capacity of the land or forests.



Pix : Ghani Zaman for CPSW.

PROMOTION OF INDIGENOUS VARIETIES

This entails the improvement of the indigenous varieties, rather than pushing the 'exotic' ones varieties, which are beyond the capacity of many to manage. A United Nations Report states that, western technology and rapid population growth are threatening hundreds of native breeds of livestock with extinction, in countries around the world. As many as one third of the estimated 3,000 breeds and strains of domestic livestock could be in jeopardy.

With intensification of human habitation, and the use of natural resources, we are impoverishing the world in its biological diversity year by year and we could even be harming our prospects for survival in the long run.

The disappearance of those species, can impoverish the country in which they exist, because the natural species have adapted to local diseases climatic stress & available source of feed. Farmers a generation from now, may face new livestock diseases & will need the resources of all the different genetic material, that evolution has thrown up, to be equipped to handle that situation. The UN Food & Agricultural Organization has already launched a five-year 18 million dollar plan, to invent and help preserve native livestock breeds add strains through conservation, semen banks and other measures. (Western technology threat to livestock. Indian Express Report - 30.10.92)

Though the state Govt. has plans for the development of indigenous breeds of cattle and buffalo from 1992-93, through a new centrally sponsored plan scheme, it has to stretch it beyond the present aim of 'producing superior genetic breed to augment milk production'. It should rather aim at improving the indigenous breeds of livestock, with their survival adaptabilities, so that it becomes manageable at the same time profitable (with less number), even for poor rural households.

RURAL WOMEN : NEED MORE ACCESS TO KNOWLEDGE & TECHNOLOGY

In rural India the care of cattle and poultry is the responsibility of women. But their knowledge regarding animal health care is very limited. With veterinary sciences and modern technology spreading to rural areas, some of the traditional knowledge on animal care with local herbs and indigenous medicine has died. Like grandma's home made remedies, the ancient herbal medicine therapies are allowed to languish and no efforts are made to impart knowledge of the new modern veterinary practices to the rural women.

The local vets are invariably 10 or 15 kms. away from the village and by the time they returned with assistance, the animals are more often dead than alive. The rural women also feel uncomfortable to discuss with the male vets important subjects like artificial insemination, problems in calving or even the new technique of fetus implants to increase the economic life span of cows. Yet all this knowledge is considered important for modern animal husbandry. Recently the Indian Association of Lady Veterinarians (IALV) have brought out a well alliterated manual on management and care of goat, sheep, cows, pigs & even rabbits. The manual to be translated initially into Hindi and subsequently into different Indian languages, will be the rural women's bible for animal care. Since it is largely pictorial it should normally be easy for women to follow even if they are semi literate.

Dr.Thankam Matthew, the founder Secretary and the President of IALV says it is vital for women who care for animals to keep abreast with information on the new ailments surfacing. The pattern of diseases too is changing. Rinderpest and foot and mouth diseases are coming back. Diseases like anthrax transmitted by mucous are notifiable. For poultry there could be no greater source than the Ranikhet disease. All these diseases and their treatment has been spelt out in the guide that has been prepared. The high breed cows and buffaloes are also susceptible to infections. Women vets are also cooperating with the Indian Council of Agricultural Research to ensure that the sturdy, traditional breeds like Raichur cow which is small but gives plenty of milk don't become extinct.

Dr. Matthew feels women being more sensitive than men have a natural gift for animal care. Though the IALV was started only in 1985 it has 300 members. Every year an annual conference as well as or scientific session is held. UNIFEM (United Nations Fund for Women's Development) which is promoting government rearing in Orissa as the rural women's wealth hopes that the bridge it has established between the lady veterinarian and the rural women will bring prosperity to the villagers. (Experts from Bridging the gulf between vets, rural women's. Indian Express, Delhi Edition, 06,05,1992).

HOPES DESPITE CONSTRAINTS

Access to markets (to sell animal products) and to input services like Livestock Aid Centre are some of the major hindrances for livestock rearing in remote inaccessible areas. In many tribal villages the concept of a Livestock Aid Centre is hardly known to people. CPSW Village Environment Research Team reports complete absence of livestock support services from their field work area - Badasilinga of Nayagarh district and Sindhagora, Masangora area of Phulbani district.

Animal husbandry can partly contribute to the family nourishment. But consuming milk is not a habit with many tribal communities. Despite all these constraints, if handled judiciously, livestock rearing still holds a lot of hope, both for the rich and poor, as an environment friendly, sustainable source of income, provider of nutrition, energy, manure. This will entail reorientation of the livestock development programme. It is not going to yield the desired results, if it is allowed to continue in the way it has been carried out in the past with milk and meat production mostly targeted for the urban market.

All the aspects of livestock rearing have to be given due importance. Employment is to be secured, for all those who to a great extend depend on livestock. The responsibility of developing 'animal husbandry' proper should be done not just 'Diary and meat production'. The livestock programme needs to be approached from a holistic point of view.

Draught power, if utilized innovatively through development of appropriate machinery, for the diverse needs in rural areas, holds great potential to tackle the energy crisis in the near future. Orissan villages has to have enough healthy, functional draught power, to plough the land of innumerable small & medium farmers, who can't afford mechanization in the near future.

This can also provide sustainable cooking energy to innumerable rural households, in the form of bio-gas and manure for the over exploited, nutrient starved soil. But all this can only happen, if a congruent atmosphere is created and sustained, where, both rich and poor, people can rear livestock of their choice. India has not yet evolved any policies of programmes for its production or upkeep and proper maintenance of the properties produced, except stray, occasional and disconnected efforts.

While a lot of excitement is generated at the prospect of 'embryo transfer' (ET) technology and 'growth hormone', to help increase the milk production, children in rural areas go without milk, many rural households lose a major source of income, through livestock rearing and many starved malnourished livestock stray around the degraded grazing land. Animal husbandry still has the potential to provide a sustainable means to provide income and enhance the quality of life of the rural poor. The wisdom lies in pursuing a programme where even the poorest of the poor can have the choice of having their dependable 'Kalia - balia bullock pair, 'sweet milk' giving Chand gai' and 'Gharmani goat'.

Most of our rural energy comes from firewood. An innovative way to conserve energy and consume less wood.



Pix : Jagadish Pradhan.

ENERGY

Food, clothing and shelter - these three are the basic requirements for human living. But as the human civilization stands today, energy has emerged as one of the major fundamental needs - starting from the cooking fuel to nuclear energy. We can not have our food, move or enjoy the many luxuries of present day life without energy.

As we prepare ourselves for the big leap in the 21st century, we face acute energy crisis - many a rural households are forced to cook even once due to scarcity of cooking fuel, people face great difficulty in cremating their deads, artisans like potters gherao the officials to supply adequate fuel wood, petrol and diesel prices are hiked almost every year, power cuts have become a routine affair, farmers face great difficulty as their pump sets fail to supply water at the crucial period due to want of electricity and other fuel, industries are not able to run up to capacity - to put it in short, energy scarcity is felt in every sphere-domestic, commercial, industrial & threatens to shatter all the progress made by the modern civilization.

ENERGY NEED : THE VICIOUS TRAP

This has led to such a vicious trap that the scarcity of it, and in some cases, the attempts to produce it, now pose a great threat to the environment. Scarcity and the resultant demand on firewood continue to denude the forests while hydroelectric power stations have emerged as major causes of forest destruction, massive displacements, and adverse changes of riverine ecology. The thermal power stations too go on destroying land and vegetation in substantial areas.

An Energy has occurred due to the skewed planning process which focussed on the needs of commercial and industrial consumers ignoring the energy demand of more than 80 per cent of people who still continue to depend on traditional energy sources - the underfed bullocks continue to pull plough and carts, cooking is done with varieties of traditional fuel - fire wood, dung cake, crop waste etc. The effort to provide modern energy sources for the varied needs of the present day living has not been successful and there are already clear indications of it's limitations.

Energy shortfalls at all sections has made the govts. to take stock of the situation and energy generation programmes are now being given high priorities. However, the planners do not appear to be really worried about the environmental destruction that goes with these energy generation programmes. This entails a re-orientation as the environment is still the source of sustenance for the majority of the people - who hardly get any benefit out of the high profile energy generation programmes.

But the unconventional and renewable energy programme which was launched to provide an alternative to the conventional energy and thereby reduce the pollution and destruction that goes with it; and make it available in remote places to enhance quality. If life in rural areas has still remained peripheral, what is needed today is a rational energy programme which can sustainably meet the diverse needs of its people without being detrimental to the very sources of sustenance.

ENERGY SCENARIO IN ORISSA

Electricity - Wide Gap Between Demand & Supply : Orissa, for its major conventional energy supply electricity depends largely on hydel and thermal power. Electricity generation and utilities increased from 16.94 billion KWH in 1961 to 201.9 billion KWH by 1987-88, which is an increase of about 11.9 times. In Orissa, gross generation availability increased from 645 MU in 1961-67, to 5806 MU (including imports) in 1987-88.

In spite of the growth and expansion, it has not been possible for the power supply industry to meet the galloping demand. The consumption of electricity increased due to increasing industrial activities as well as increasing demands in the domestic sector. The number of rural consumers increased from 4.50 lakhs in 1979-80 to 8.26 lakhs in 1987-88 and the per capita consumption increased from 116 KWH in 1981 to 149 KWH in 1987.

Despite the growth, it is becoming increasingly difficult to fulfill the basic obligation of providing adequate electric energy of appropriate quality and reliability. Though, the state's economy, to a large extent, is agrarian, which is frequently affected by the failure of monsoon, it has not been possible to supply adequate electric energy to exploit the ground water resources.

The power generation scenario in Orissa at the end of the 7th Plan, was as follows : the established capacity in the state including the central share was 1675.45 MW with energy availability of 721 MW as against the demand of 1271 MW. The deficit works out to 43 per cent as against 6.8 per cent at the all India level. The ongoing power projects which are scheduled to be commissioned during the 8th plan period would augment the installed capacity in the state to 2757.5 MW with firm power of 1224 MW. During this period, the share of the state from the Central Sector projects would be of the order of 403 MW. Thus, the total availability of energy at the end of 8th Plan would be 1627 MW against the demand of 2199 MW with a deficit of 25 per cent. (Orissa Review, September, 1992)

ASSESSMENT OF CENTRAL ELECTRIC AUTHORITY :

In 1987-88, the Central Electric Authority (CEA) after studying industrial and economic growth and varying economic assumptions over 10 to 15 years has made the following forecast which includes the power availability from the existing and newly approved power plants and the share of Central Sector power generation in favour of the state. It observe that, while energy availability at national level fell short of requirement by 7.7%, a shortage of 18.7% occurred in case of Orissa.

HYDRO ELECTRIC GENERATION IN ORISSA : A HUMBLE BEGINNING

The first power station for supply of electricity in Orissa was established in 1905, at Deogarh in the the then Princely State of Bamra. About eleven years after, in 1916, a Hydro Electric Power Station utilizing the water head of Koraput water fall was installed again at Deogarh. The following three decades saw the establishment of a number of power stations in principal towns of the state like Cuttack, Puri, Berhampur, Sambalpur, Balasore, Baripada, Bolangir and Bhawanipatna. These stations of 500 KW to 25 KW capacity having oil engines as prime movers, were established either by commercial electricity supply companies or by the Durbars of the Princely States to meet the domestic needs of the towns. Two small thermal stations, one at Choudwar and the other at Jobra in Cuttack were established in the late forties to meet the industrial and domestic needs of Cuttack-Choudwar area. On 24 December, 1946, Electricity Department for the state was created with a Chief Engineer in-change.

SOURCE : Hydro Electric Generation in Orissa : Problems and Prospectsby Dibakar Mishra in 'energy situation in Orissa'.

Table - 1 : VRS's Forecast on Power Generation & Demand

Orissa	By end of 7th Plan (1989-90)	By end of 8th Plan (1994-95)	By end of 9th Plan (1994-2000)
Energy availability(MU)		6326	13200
Energy requirement(MU)		11136	19267 32466
Energy Deficit (MU)		4810	6067
Peak availability(MU)		1256	2596
Peak Load (MU)	1956	3283	5532
Peak Deficit	700	687	

SOURCE : Energy Situation in Orissa - Seminar Paper by Mr.P.K.Kar

Power Scarcity - It is not just a question of expand & supply.



Pix : Ghani Zaman for CPSW.

SOLUTION TO POWER SHORTAGE

In order to mitigate the problems of power shortage in the state, the state govt. has formulated a comprehensive and futuristic plan to implement new power projects in the state during the 8th Plan period, which include installation of coal fired power stations at 4 places through private entrepreneurs. The state govt. has already signed a memorandum of understanding with Southern Electric International Inc. (SEI) USA to set up a coal fired power plant of 2,340 MW at Ib valley.

Yet Another Assessment : However, the assessment of the State Working Group on augmentation of power in November, 1988, differs from the above forecast made by CEA. It says, with the suggested capacity addition, the energy shortage by the end of 8th Plan will decrease from 6067 MW to 5350 MW and this can be eliminated completely by 1999-2000, and the peak deficit can be impeded out from 94-95 onwards.

RURAL ELECTRIFICATION : POOR QUALITY

By end of March, 1991, 31,471 villages in the state (66.97 per cent) have been electrified. By 1990-91, 61,608 pump sets have been energised. However, routine prolonged power cuts, failure of sub stations, lack of proper maintenance and frequent theft of distribution wires have made electric supply for domestic and agricultural purposes in rural areas, in a mess.

Table - 2 : Number of Villages Electrified in Orissa

Year	Number of Villages electrified	Percentage of villages electrified
Before 1977-78	13,061	27.79
1977-78	1,100	30.13
1978-79	1.407	33.13
1979-80	1,663	36.67
1980-81	1,573	40.02
1981-82	1,226	42.62
1982-83	1,250	45.28
1983-84	1,240	47.92
1984-85	1,242	50.57
1985-86	1,141	52.99
1986-87	1,392	55.96
1987-88	1,520	59.19
1988-89	1,371	62.11
1989-90 (P)	785	63.78

SOURCE : Orissa State Electricity Board "OSEB, at glance, Bhubaneswar"

Negotiation is on with M/S. Kalinga Consortium, New Delhi, to set up a new Thermal Power Station of 1,000 KW at Duburi. Also, following the state Govt's. request to Govt. of India for establishment of Super Thermal Power Station of 10,000 MW in Ib valley and Talcher coalfield areas, National Thermal Power Corporation (NTPC) has come up with a proposal to install a super thermal power station at Hirma in Sambalpur district.

THERMAL POWER : ANY SOLUTION TO POLLUTION

Since from investment angle it is proposed to encourage large scale private sector power generation and captive power generation by industries, a large number of smaller stations would be proposed. This will bring the added danger of pollution all around, hence a very strict watch on this aspect is necessary.

Exploiting the huge coal reserve in the state for power generation is a good idea. However, considering the fact that so far it has not been possible to handle the pollution caused by Talcher Thermal Power Station which plays havoc with life of the people of that area, the fear of pollution and hardship associated with the Thermal Power Station to come up in near future is not unfounded.

Conservation & Alternatives : Lacks will Power

While new programmes are being planned to enhance generation of electricity, a number of ways of conservation and alternative ways of electric generation are proposed. It is suggested that energy audit in big industries to find out scope for energy conservation be introduced since the share of industries in energy conservation is quite high (around 70%). The general awareness regarding energy conservation in Orissa is very poor and there has not been any considerable effort in this regard. It is also suggested that a fresh look at the policies of generation and distribution which at present is mostly done on a political basis, be taken. And the non-conventional ways of power generation-wind and solar power, mini-hydel, sanifiers - have great potential to supplement the power generation. But these are yet to come out of their adhoc experimentations and the serious lack of faith and will power on the part of govt. to implement them.

RURAL ENERGY SCENARIO : NON-COMMERCIAL SOURCES DOMINATE

The country is spending nearly 35% of plan outlay for generation and supply of energy. But unfortunately, about 80 per cent of our population living in rural areas get only 20 per cent of the commercial energy (out of coal, oil and hydro-electricity) to meet 10 per cent of rural need. Balance 90 per cent comes from non-commercial sources like fuelwood, animal dung, agriculture waste and animal sources.

Household Cooking - Major Consumer

In rural Orissa, the household sector is the main energy consuming sector followed by the agricultural sector. The energy consumption in cooking is disproportionately high as food is being cooked by most of the people in a semi-open space with a chullah whose efficiency is less than 8 per cent. This happens in spite of the fact that a substantial portion of rural population only prepare one meal a day.

Apart from energy for cooking, the other major needs for rural area are for lighting and agricultural activities. Though around 66 per cent of the villages have been officially electrified, a very low percentage (8%) of households have taken connections. But for load shedding and other interruptions, kerosene is used as major fuel for lighting. The erratic supply and prohibition cost forces many a households to limit their energy activities to the minimum. In interior hilly areas, in quite a few pockets, wood fuel is used as a lighting source. In agricultural activities, human and animal energy are still major sources of meeting the energy need.

Table - 3 : Per Capita Consumption of Energy Sources in Tribal Areas

	Annual Per Capita Consumption				
	Firewood (Kg.)	Dung cake (Kg.)	Kerosene (Lit.)	Coal (Kg.)	Electricity (KWH)
Household Sector	1010	Neg.	4.08	—	1.10
Industrial(Incl. artisinal group)	7.22	—	0.01	0.10	1.35
Commercial Sector (Hotel, teashop, weekly market)	20.10	—	0.12	20	Neg.
Community activities	16.43	—	0.15	—	—
Agriculture Sector	(37 Mandays/acre and 23.5 bullock days arce being utilised depending on cropping pattern).				
Transport Sector	(Agriculture inputs over 95% and agriculture pro duces over 80% are carried by farmers themselves. Balance by other mode of transport like bullock cart etc.)				
Total	1054 (say)	Negligible But on an average 650 kg wet dung is available	4.36	0.30	2.45 + 2.95 for lift irrigation pumps

SOURCE : Energy Scenario in Orissa - Seminar Paper by Mr. S.K.Ghosal

DEPENDENCY ON FUEL WOOD IS TOTAL IN SOME AREAS. THE WOOD MARKET IN TITILAGARH OF BOLANGIR DISTRICT. PIX : GHANI ZAMAN FOR CPSW



Table - 4 : Per Capita Consumption of Energy Sources in Plain Areas

	Annual Per Capita Consumption							
	Fuelwood (Kg.)	Dungcake (Kg.)	Agrowate (Kg.)	Coal (Kg.)	LPG (Lit.)	Kerosene	Elect. (KWH)	Diesel (Lit)
Household Sector	365	71	17	4.5	Neg.	7.5	20	—
Agriculture Sector *	—	—	—	—	—	—	8.2	0.4
Transport Sector **	4.43	—	—	2.45	—	0.02	2.0	—

* Approx. 35 mandays/arce and 115 bullock days/ acre are being utilised

** Human and power utilization not assessed.

SOURCE : Energy Scenario in Orissa - Seminar Paper by Mr.S.K.Ghosal

The present level of fuelwood consumption for cooking in tribal areas is disproportionately high due to easy availability of fuelwood at low cost or free of cost. Use of dungcake as fuel is very negligible. The per capita consumption shown for the tribal areas represent 23 per cent of state population. In plain areas too, non-commercial energy sources supply about 87 per cent energy need of household sector (fuelwood 74% + dungcake 9% + 4%) while electricity & kerosene meet about 12 per cent of household need.

REGIONAL VARIATION

The trend of energy consumption varies from region to region because of variation in literacy, income, cropping pattern, food habits, use of different cooking pattern, use of different cooking appliances, existence of forest and other vegetation, irrigation and industrial status, electrification status etc. The acute problem of domestic energy shortage is met by fuel available in the surroundings - firewood, twigs, leaf, dung cakes, crop waste etc., are collected free of cost from their own land, common properties and other areas in the vicinity of the villages.

Fuel Wood - Varied Pattern of Use : Domestic cooking consumes the highest share of fire-wood in the household sector. A study conducted by ORG (Bhubaneswar based consultancy group) revealed that, in rural areas, the percapita annual consumption of firewood comes to 382 Kg. This also shows that the relatively better off economic sections of population have greater access to fuel wood than the poorer sections of population. For cooking, about 67 percent of marginal and landless households reported using dry leaves as against 25 percent in case of large and medium farmers.

The quantity of consumption of fuel for cooking in a family largely depends upon the size of the household. The average household consumption of wood and fuel for large, medium and small rural families are 3222.6 Kg, 2249.5 Kg. and 1625.1 Kg. respectively. The corresponding figure in urban region were 1998.5 Kg., 1310.2 Kg. and 1130.7 Kg. At the total level, the average consumption of an urban household works out to be around 62% of the average consumption estimated for a rural household.

Apart from domestic cooking, the other important activities which consumes substantial amount of wood fuel include space heating, boiling of paddy, processing of crop produce, cattle feed preparations, ceremonials and festivities weekly markets, cremations etc.

Considering all the relevant domestic activities involving the use of wood fuel, the consumption worked out to 568.5 Kg. and 324.9 Kg. in rural and urban areas respectively.

Consumption of wood fuel includes branches, twigs, leaves charcoal etc. Average per capita annual consumption (%hh) represent the households reported.

Table - 5

Type of consumption	Rural (Kg.)	Urban (Kg.)
Cooking	430.6 (99% hh)	298.9 (84.6% hh)
Space heating	40.3 (47.1%)	1.9 (4%)
Boiling of paddy	59.1 (65.6%)	4.8 (2.9%)
Preparation of cattle feed	13 (13.3%)	2.1 (2%)
Water heating	18.8 (27%)	12.5 (25%)
Cooking during ceremonies	6.7 (36.1%)	4.7 (12.8%)
Total	568.5	324.9

Based on - Data source Wood Balance in Orissa by 2000 AD. By ORG, Bhubaneswar (1989)

.Fuel wood collection and Marketing is providing employment to thousands of people in rural and tribal areas.



Pix : Ghani Zaman for CPSW.

Wood is an essential energy source for various things

Pix : Ghani Zaman for CPSW

WOOD FUEL : SHORT IN SUPPLY

On the basis of the study it can be calculated that for domestic, community activities and other major wood fuel consuming activities, such as artisanal, brick making commercial institutions the per capita per annum consumptionof wood fuel in rural areas is 591.59 Kg. The acute problem of domestic energy shortage is met by using assorted fuel dung cake, weeds, creepers, agro waste, crop residues etc.

The Human Plight : Considering the pattern of use - fuel wood, cow dung, agricultural waste and other type of fuels, Orissa can be broadly divided into 3 zones : the deltaic plain, the middle zone (still retain some forested areas) and the forested and tribal zone. The problem of fire wood is acute in coastal districts as well as in many pockets of the middle zone. The middle zone is comparatively less agricultural and forests are under heavy pressure. The third zone is loosing it forest wealth due to unplanned cutting of trees & the pressure of shifting cultivation.

The depletion of vegetation from the village commons, village forests, change in the cropping pattern and the resultant decrease in agricultural waste has put a substantial area in severe stress condition. And where they are available, it takes substantial time and pain to collect them as these are found in distant and scattered places. In this situation, it is the women and children who shoulder the maximum burden. The traditional gender division of labour has made the women responsible for the collection of daily survival needs such as fuel, fodder, water, edibles etc. In the recent times, in most parts of the state, these items of survival have become scarce owing to deforestation, devegetation intensive monocropping etc. This has put the women, and children, more specifically from landless and marginal land owning families, who depended on their immediate environment for free supply of fuel, fodder, edibles, house building material etc., to an unending path of hardship, misery and malnourishment.

Fuel Wood Consumption in Non Household Activities :

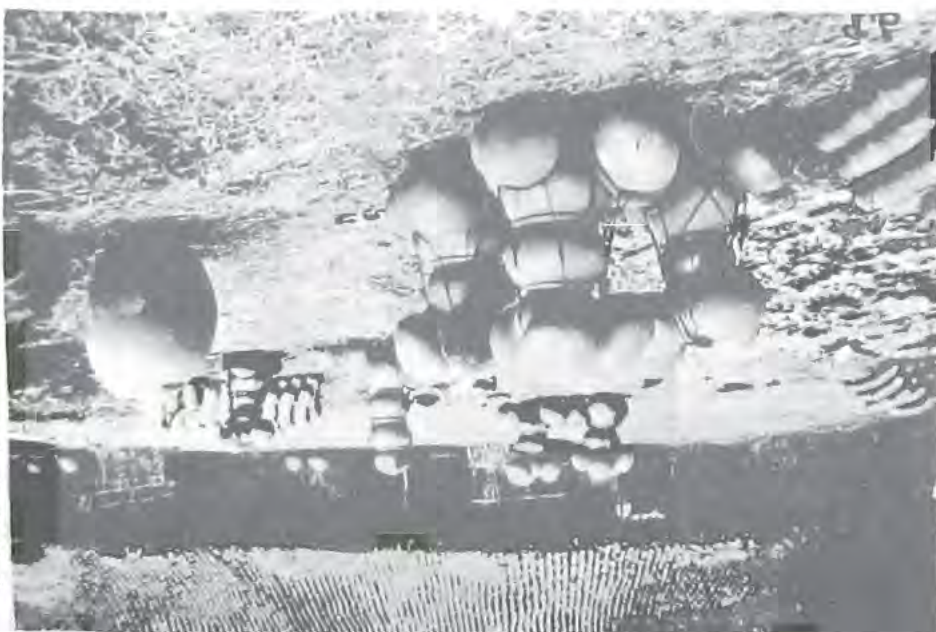
The study collected information regarding wood fuel consumption in community activities. These include community festivals/ceremonies, community level space heating, weekly markets etc. The average per capita consumption of wood fuel consumed in community festival/ceremonies worked out at hardly 0.9 Kg. per annum. Space heating in winter days is a common practice in rural areas particularly in tribal dominated regions. The average per capita consumption of firewood for this activity worked out to 0.7 Kg.

The practice of burning firewood for the cremation of dead bodies is prevalent among many communities. The study revealed, the average number of deaths for every 1000 population worked out to nearly 9.2, of which the number of adult deaths were 7.0. Nearly 250 Kg. of firewood is consumed in performing one cremation and the per annum per capita consumption is worked out to nearly 2 Kg. Taking the wood fuel consumption for all these activities together, the average per annum per capita consumption works out to 3.6 Kg.

Artisanal & Commercial Units - Substantial Dependency on Wood Fuel :

The study also gathered data on consumption of fuel wood in rural artisanal units including laundry, blacksmith and pottery. The per capita consumption of fuel wood consumed for these activities worked out to 13.5 Kg. per annum.

A substantial amount of fuel wood is also consumed for brick making and by commercial establishments such as hotels, resturants, tea shops etc., in both rural and urban areas. The study reveals that for brick making 2.39 kg. of fuel wood per capita per annum is consumed. And for the commercial establishment annual per capita consumption is 3.6 kg. in rural areas and 46.7 kg. in urban areas.

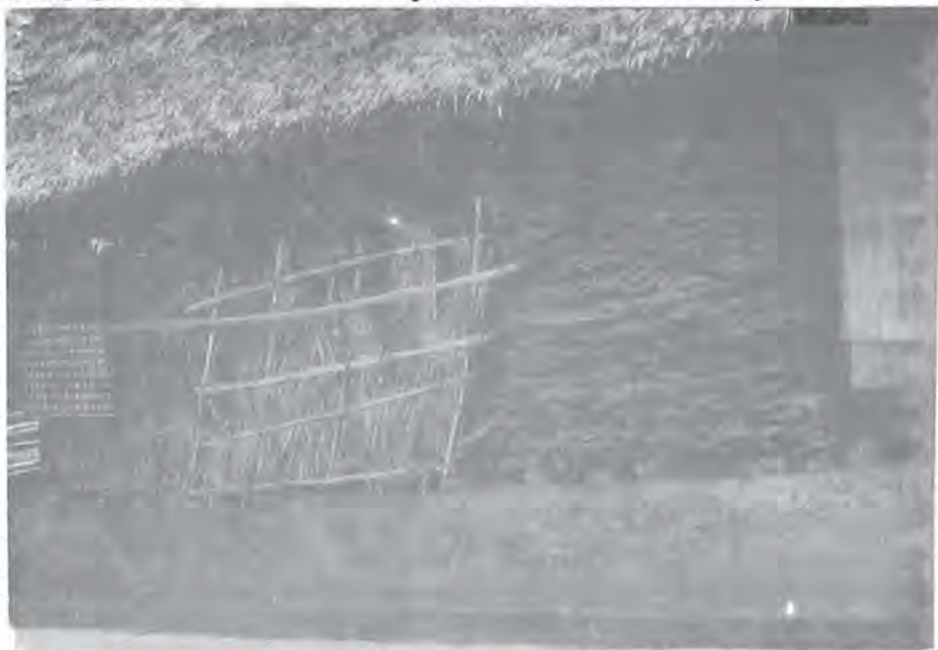


Pix : Sanjay K. Khatua

Scarcity of wood forces the potters to use straw as the fuel

COOKING FUEL - THE ENERGY DRAIN

Cowdung is burnt as fuel, instead of enhancing the soil productivity.



Pix : Sanjay K. Khatua.

Following the environment degradation, cooking fuel at present tops the list of survival needs. It is one of the major factors causing enormous energy drains of the rural women.

"We can live a day without rice but not without fuel" - observed Bana Dei of village Kansil, of Bangamunda Block, in Bolangir. This village is located in a rainfed single cropped area with almost no vegetation in the immediate village environment except a few privately owned trees in homestead and agricultural land. Like many other villages in this area, this village has been badly hit with a fuel crisis since the last 10/15 years - after the vegetation in the vicinity was finished and after their crop failed successively due to recurring dry spells.

In this village, while women fuel gatherers in general constitute 54 percent of the total fuel gatherers; in landless families, it is 82 percent and the girl children below 12 years constitute another 10 percent. Children mainly collect cow dung from the fields.

CASE OF BANA DEI

Bana Dei; aged 20, unmarried, from a landless family; goes for fuel collection on alternate days. She goes around six o'clock in the morning and returns around 1.00 PM in the afternoon. One day's collection lasts for two days. Her usual collection includes : Nakalam, Kolathia Creeper, and wild plants like Gandha Tulasi, Bajra Muli, Gangateli, etc. which usually grow at the roadside and in uplands. Some fuel is saved for the partial requirement of the rainy days.

DECREASED MALE PARTICIPATION

In close-to-forest villages, where it is still possible to collect fuel wood in bulk, the involvement of men is comparatively greater. But when collection becomes difficult and a variety of fuel is collected from different sources it gradually becomes an all-woman's responsibility.

In village Barapadar and Mankadachuan (Kantamal block, Phulbani and Sadar block, Bolangir) the male members of the households used to collect fuel wood in bulk twice or thrice in a year. But, this situation is changing very fast. Harassment at the hands of the forest guards, men's reluctance to collect dry twigs spending half a day (that is what is officially allowed now) has led to a steady increase of the women collectors as well as the frequency of collection. Men believe that women are less harassed at the hands of forest guards - but women tell a different story. They are compelled to give occasional bribe to the guard in cash (Rs.3 - 5) or in kind (rice). Now they go for fuel collection once in every three days.

This is also the case in Wallipur (Gania, Puri), where the number of women head loaders have increased substantially after the bulk collection by men was discouraged and the collection became difficult and more time consuming. In Karatanga (Binika block, Bolangir) where the 'forest' is now at a distance of 7 kms. the women constitute more than 80% of the fuel collectors, who follow a twice in a week cycle. Fifteen years before, the men of Karatanga used to collect the requirement for the year, in bulk.

The situation is not different in the distant to forest and plain villages. With more and more amount of land coming under cultivation, more and more commons coming under encroachment, shrubs and bushes vanishing from bunds, and lands degrading due to over exploitation, fuel gathering has become a back breaking task for women and children. Men have almost completely withdrawn from the responsibility. Having finished the shrubs and bushes the landless Harijans of Adhanga Mallikes -warpur (Derabisi block, Cuttack district) at present have restored to 'Screw Pines', locally known as 'Kia'.



Pix : Sanjay K. Khatua.

Specially houses are made to store fuel for scarcity seasons (Jala Ghar)

FUEL 'PROCESSING' - A NEW CRAFT!

The responsibility does not end with collection. As the collection of fuel takes increasingly more time, and as more new varieties of fuel(creepers, shrubs etc.) are being used, it has become a necessity to 'process' the fuel in various combinations : quick burning and slow burning creepers are made in to neat plaits, special cowdung sticks are prepared by applying cowdung on 'Nakalam' and other sticks. These are done in order to make the fuel manageable, save fuel and time, and reduce the stench of some specific varieties (Nakalam).

Rolls : in Karatang (Binika block, Bolangir) fuel rolls are made of tender Kendu stem, kendu leaf wrapped with creepers

Plaits : In Kansial (Bongamunda block, Bolangir) women make plaits out of Kolathia lata, a creeper grown at the road side and high lands.

Sticks : In Betanda, Adhanga Mallikeshpur (Rasulpur and Derabisi Block, in Jajpur & Kendrapaa district, women make dung sticks by applying cattle dung on various sticks. This has added one more responsibility to the already long list of activities and consumes the hard earned 'leisure time ' of women.

Recurring Care : In cases where it is possible to store leaves, creepers etc. for later use, they need to be brought out in intervals, put in sun and again put back - primarily to avoid rodents and snakes, keep them damp free and usable. This again is an additional burden on women.

INCREASED AGRICULTURAL ACTIVITY - A DECEPTIVE FUEL AFFLUENCE

Increased agricultural activity in some cases has taken out the burden of fuel collection for some families to some extent. In Karatang (Binika block, Bolangir, located in the tailend of the Hirakud canal system) 24 percent of the households use crop residue (hey,etc.) in combination with other fuel. Here a high yielding variety of paddy is cultivated in more than 70% percent of the land both in Kharif and Rabi which supplies the major portion of the surplus crop residue. Yet the people have already started withdrawing from summer paddy due to declined production and not so encouraging cost efficiency factor.

In Betanda , (Rasulpur block, Cuttack) the farmers have been extensively cultivating groundnut and vegetable with considerable amount of sugar cane since the last 7/8 years. About 40 households including landless and marginal farmers also cultivate these crops in encroached common land.

No doubt, these produce huge quantities of crop residue and have made about 50 per cent of the households "fuel rich". As a spin off of the 'crop residue boom' the landless and near landless 'non-encroachers' collect the left outs (after the farmers gathered their need) which is never sufficient and continue with collection of different varieties of fuel which is getting more time consuming day by day owing to increased agricultural activities and destroyed commons.

Whatever access they have to the left over crop residues will not last long. The trend shows that people are interested to bring more lands under ground-nut cultivation and discontinue with the labour intensive and not so profitable (in comparison with groundnut) sugar cane. If that happens, the dependency on the groundnut residue will be manifold and there will be hardly any left over for the landless. Already, the farmers have started prohibiting the landless from collecting crop residue from their fields.

This fuel affluence is deceptive because -

- Women prefer to use the crop residue in combination with cow dung and brush wood. Hence, it does not help saving the valuable 'dung', which is most required for the fertilizer affected fields.

- Except few varieties, quality wise the crop residues are not preferred by women, while the quantity of crop residue produced gives satisfaction to men that they have solved the fuel problem. It does not help the women very much, except in saving collection time. They are left to deal with the huge quantities of belching smoke.

- Intensive agriculture does not allow cattle grazing in open which further limits the dung collection for the poor and the scarcity of grazing land does not encourage people to keep more herds of cattle.



LEAVES AND TWIGS ARE THE MAIN FUEL SOURCE NOW A DAYS WHERE FORESTS ARE PROTECTED
PIX JAGADISH PRADHAN

Agro-wastes (Sugarcane waste) is dried and used in coastal areas. Cooking by this is a difficult job for women.



Pix : Sanjay K. Khatua.

Fuel Takes Priority Over Education : Narendra Das, a 14 year old boy of Betanda village, (Rasulpur Block, Jajpur district) has not attended school and no one has ever told him about reading. His father Pitambar Das is a landless agricultural wage earner and stone cuter. Till he was 10/12 year old he was wandering and playing with other village children. Since last two years he is engaged in fodder collection, calf herding and fuel collection.

Everyday Narendra takes his male calf for grazing, collects fodder (grass) and fuel for his household consumption. Twigs, small roots and leaves are the major fuel collected by near about 60 children of the village. Children collect the leaves and twigs of banyan, mango, jack fruit, jamun and palasa from village common property and 'Matha' orchard. In early summer, more quantity of leaves are collected. In the month of Phalguna and Chaitra, when leaves fall in large quantity, children go to collect it early in the morning.

As Narendra told, the number of fuel collectors increase in summer and winter. At that time during the Dhana Muli season (lower part of paddy left out while reaping) they collect plenty of fuel. The number increases up to 150. Women and old women accompany the children at this time. The 'Dhana muli' is usually heaped in back yard and used for paddy grain boiling.

Narendra also reported that with leaves and twigs they also collected roots of various trees and plants by spade. Usually they collected small roots of Ambo, Bara, Inda and Kaniar from village common lands and 'Matha' orchards and the roots of Nankasia, Chaulia, Sabada and Arakha both from agricultural lands and common lands. They also collect Gandhi plant from agricultural lands and road side. He further told that the children engaged in fuel and fodder collection are from landless & marginal farmer families. 70% of these children do not go school at all, other go occasionally. 80% of the children are girls.

Impact on food habit : Increased workload of women and scarcity of fuel greatly influence the habit of food intake, especially in the landless and near landless households. In Kansil, Karatanga and Batanda, people in about 30 percent of the households take Pakhal or watered rice during day time. They are forced to keep up to this habit, simply because women do not have time, and fuel is not enough. Another reason for the preference of watered rice is that it can be 'swallowed' just with salt, chilly, onion, dry fish or smashed potato etc. After a tired field work and fuel collection trip "we return home tired and find no patience to cook, using leaf and creeper fuel" - observed Bana Dei of Kansil.

Health Hazad : The situation being what it is, about 70 percent of the households cook inside the living room which is also used for sleeping and storing things. More than 90% of houses in these villages do not have windows or other ventilation facilities, other than the door. The congested place, having no ventilation facilities and the fact that more than 70 percent of the households use leaves, creepers, cow dung, crop residue as fuel - some varieties (Nakalam) belch unbearable smoke - forms a deadly combination which plays havoc with the women's health. A number of women in the villages complained of smoke and heat. Though some of the households have cooking places in the open, the type of fuel stel available forbids its utilization for fear of a fire hazard.

Fuel Scarcity - Artisans Face Problem : Fuel crisis has badly affected some of the occupational groups like - Gudias (who trade in mudhi, lia, etc.), and the potters. Gudias require substanntial amount of fuel almost every day to prepare mudhi and lia. Again, to keep the cost of their products - which are popular Jalakhia (Snacks) in the villages - within the buying capacity of the villagers, they need to use free of cost fuel. As in most of the cases the Gudias are landless or marginal farmers, they usually depend on village commons for collection of their daily requirment of fuels which is getting increasingly difficult.

The Potters require huge amount of fuel for their kilns. The potter women folk used to collect it from the village commons. The over exploited, encroached village commons no more yield enough fuel which has put enormous pressure on potter women folk who in some cases forage through an area of 15/20 km. radius to collect the required quantity of fuel wood. This has forced many either to wind up their occupation or substantially reduce production.

After Extracting the fiber, this sticks (Kaunria) is stored for use in Derabish area in the coast.



Pix : Sanjay K. Khatua.

WASTELAND : MANY UTILITY

Various land development activities and changes in the cropping pattern have far reaching implication on the fuel resource of the villagers, especially landless and marginal farmers. Water logged, swampy, low lying waste lands have a major contribution towards the fuel required and used by rural poor of Orissa. Aquatic grass, reeds, weeds, etc., which naturally grow in these lands have an enormous value for the rural people, especially the poor. The CPSW Village Environment Appraisal team reports that Gaichara, Ragada, Nakama, Juna, Bena, Khari, Sola, Dala, Jamchi, Tharathari, Santara, Beruban, KandaKandua, etc., are the major species of grass, reeds and weeds that usually grow in water logged areas and low lands such as Joda, Pata, Nayan Jori, and by the side of canals, streams, rivers and drainage cuts, etc., are used by the rural poor.

In Berhampur - a hamlet of Purusottampur, Kendrapara block, Kendrapara, the team found that straw, cowdung cake, reeds, weeds and grass are the major fuel types used by the people. No one used wood as fuel, except on the major social occasions. The village has very negligible vegetation cover.

FORMIDABLE CHALLENGE

Considering the human plight and its implications on the environment, the challenge before the planner is how to keep the chullahs burning in every household including the landless and marginal farmers till an acceptable alternative to cooking fuel is found, and at the same time lessen the burden on the beleagured women, check deforestation and depletion of vegetation from village surroundings.

In Orissa, there is no dearth of planning excersises in order to find ways to meet the fuel wood demand. Mr. G.S.Padhi Chief Conservator of Forest puts the annual production of wood fuel in Orissa from all sources including illegal removals at about 8.6 lakh Mt.

WOOD FUEL

- actual production by forest deptt.	- 3.60 lakh Mt.
- by tenants through annual permits	- 2.00 lakh Mt.
- by illegal means	- 3.00 lakh Mt.
	8.60 lakh Mt.

Out of this the requirement of Board and Paper industries is about 1.60 lakh Mt. The rest 7.00 lakhs Mt. wood fuel only is available for domestic consumption and use by small industries as against their requirement of 75 lakhs Mt. per annum.

Futher, Mr. G.S. Padhi has made a perceptional assumption regarding the utilisation pattern of different types of energy in domestic consumption.(see table below).

Table - 6 : Utilisation pattern of different types of energy in domestic consumption.

Total population 300 lakhs	Urban Population 5% or 15 lakhs	- 80% gas, coal, electricity. - 15% (2.25 lakh) wood - 5% cowdung & other biomass
	Semi urban 10% 30 lakhs	- 20% gas, coal, electricity etc - 60% (18 lakhs) wood -20% cowdung and other biomas
	Rural population 70% or 210 lakhs	- 70% (147 lakhs) wood -30% cowdung and other biomas
	Forest villages 15% or 45 lakhs	- 100% (45 lakhs) wood.

Besides this, small business men and professionals like hoteliers, Dhabawalas, eastery shops, brick kilns, occupational groups like potters, blacksmiths use substantial quantities of fuelwood.

Working on these assumptions Mr.Padhi estimates that the total population using wood fuel for cooking and heating purposes would be 212.25 lakhs. Taking the average size of a family to be 6 persons, 212.25 lakhs people would consitute 35.37 lakh families who would require wood fuel for their domestic energy requirements. This number is further reduced to 30 lakhs standard families with more or less uniform use (to adjust the variation in use). Taking 24 quintals of wood fuel as average requirement per family per annum, he estimates that 72 lakh Mts wood fuel is required for these families. He estimates that another 3 lakh Mts. of wood fuel would be necessary for the institutional, artisanal and rural industrial needs. Thus as per his estimate, the requirement of wood fuel would be 75 lakhs Mts.





LEAVE FUEL IS AN EXCHANGABLE COMMODITY RELATED TO SOCIAL RELATIONS. THIS MAN IS BRINGING (BEBHARI) LODADED FROM HIS FATHER-IN-LAW'S HOUSE ASHE HAS NO PROTECTED FORESTS IN HIS VILLAGE.
PIX : SANJAYA KHATUA

In order to bridge this gap between requirement and availability, Mr. Padhi further argues that the potential of producing fire wood from forests is much more than 8.60 lakhs Mt. per annum. He says, due to lack of intensive planning, all the fire wood available in the forests is not being broughtout from the forests. What is removed as firewood, is the lips and tips of matured trees felled during the annual cops for production of timber and immature trees removed illegally by the smugglers. He further says, besides firewood there are many other materials available in the forest such as branches and end cutting of bamboo and brush wood and woods like Lantana and Eupetoriam which can be systematically extracted/harvested. He argues, that if proper care is taken and and dead and dry wood is collected from the forests systematically and all silvicultural operations in the working plan for management of forests are taken up in their proper sequence, large quantities of firewood can be obtained without any detriment to the standing crop.

THE GAP STILL REMAINS

Mr.Bijay Ketan Pattanaik, General Manager and Conservator of Forests, Orissa Forest Development Corporation Ltd., Koraput has put forward another planning exercise to meet the basic forestry requirements of the people. he quotes the observations made by a working group on Energy Policy, 1979, and puts the positions of fuelwood consumptions per capita vis-a-vis, other sources of energy in rural and urban areas as follows.

Table - 7: Percentage share of energy forms in per capita consumption.

Types of Energy	Rural	Urban
Electricity (Commercial)	0.6	5.9
Oil Products (Commercial)	16.9	30.2
Coal Products (Commercial)	2.3	3.7
Fire wood (Non-Commercial)	68.5	45.5
Animal Dung (Non-Commercial)	8.3	3.2
Others (Non-Commercial)	3.4	1.5
Share of Commercial Fuels	20%	49%
Share of Non-Commercial Fuels	80%	51%

He has made the following projection of fuel wood demand on the basis of an F.S.I report that the per capita annual consumption of fuelwood in Orissa range from 0.25 to 0.4 tonnes in urban areas and 0.4 to 0.54 tonnes in rural areas.

Table - 8 : Projected Fuelwood Demand is lakh tonnes in Orissa during VII Plan(1992-97)

Year	Projected Population (lakh)		Demand for fuelwood in domestic activity		Total demand (in lakh tonnes)
	Rural	Urban	Rural	Urban	
1992-93	273.10	55.25	122.89	16.57	139.46
1993-94	277.11	58.20	124.70	17.46	142.16
1994-95	281.19	61.31	126.54	18.40	144.77
1995-96	285.32	64.60	128.39	19.38	147.77
1996-97	289.51	68.06	130.28	20.41	150.69
			632.80	92.22	725.02

Going through the present and future productivity level of different sources he has compiled the following projection figures for demand and supply of fuelwood and timber for different year of 8th Plan Period.

Table - 9 : DEMAND SUPPLY GAP BASING ON TREND OF OUT TURN (During VIII Plan)

Year	Demand for fuelwood	Demand for small timber	Total demand	Supply from * Natural forest	Supply from Govt. Plantation	Supply fom Social foresty Plantation		Demand Supply gap.
1992-93	139.6	2.24	141.70	1.01	3.24	25.0	—	112.45
1993-94	142.16	2.27	144.43	0.98	3.15	25.0	1.13	114.17
1994-95	144.94	2.34	147.28	0.95	3.06	25.0	2.88	115.39
1995-96	147.77	2.36	150.13	0.93	2.97	25.0	5.53	115.70
1996-97	150.69	2.41	153.10	0.90	2.88	25.0	7.25	117.07

* Supply from natural forest is calculated basing on actual outturn of 90-91 (recorded) as proportionate to forest area, taking into account 2.83% decrease in forest cover/annum.

Yet Another Exercise ; Stress on Planttation & Energy Saving/ Conservation Devices :

Sometimes plantations are cut to use or sell - A great loss. This is only source of survival for some people



Pix : Sanjay K. Khatua.

Operations Research Group(ORG) in their study 'Wood Balance in Orissa by 2000 AD' puts the total demand of fuel wood in domestic sector(rural+urban) at about 185.59 lakh tonnes, demand of fuel wood for artisanal activities by 2000 AD. at about 13.098 lakh tonnes for community level activities, about 1.10 lakh tonnes and for rural and urban commercial establishments (hotels, dhaba etc.) at about 5.082 lakh tonnes. As per its estimates, the aggregate demand for fuel wood will increased from 164.043 lakh tonnes in 1989 to 207.370 lakh tonnes in 2000 AD., registering an increase of an average annual rate of 3.61 lakh tonnes.

It observes " the important parameters influencing the dynamics of wood resource generation are the rate of plantation (both afforestation and regeneration of degraded areas), area covered under plantation, density of trees planted and the rate of harvesting. On the demand front, it is largely governed by the growth rate of population, economic development, urbanisation, promotion and implementation of energy saving and conserving devices and use of other substitute fuels, especially renewable energy sources," According to the National Forest Policy (1952), a stable ecology can be ensured by covering at least one third of the geographical area of the country with desirable level of forestry. Accordingly, ORG has prepared two sets of projections of demand and supply of fuel wood - one, considering ecological aspects and the other, without any consideration to ecology. The one considering the ecological aspect reveals that with the existing rate of plantation, even taking all sectors together, fuel wood supply will fall short of the requirement. It observed that the present rate of plantation is hardly 1 lakh ha. or one -third of the present deforestation rate. It lays stresses on the need to step up the rate of plantation and considering the past trend of afforestation/ plantation, calls for concerted efforts on the part of the planting agencies not only to increase the area under plantation but also to take up measures in increasing the survival rate and plant density.

In many areas social forestry plantations are the only source of providing the cooking fuel. To distant places, only men are able to travel.



Pix : Sanjay K. Khatua.

Table - 10 : Demand supply Gap of Fuel Wood (considering Ecological Aspects) **(in lakh tonnes)**

Year	Harvestable area in ha. (Terit + Inst)	Harvestable trees (In lakhs)	Out Turn Territ + Insti	Farm S.F Plant	H.H Plant	Total availability	Total demand	Demand supply gap
1989	28166	120	1.95	—	3.30	5.25	164.043	158.80(-
1990	28166	120	1.95	—	3.29	5.24	167.234	162.00(-
1991	28166	120	1.95		3.28	5.23	170.655	165.42(-
1992	28166	120	1.95	—	3.27	5.22	170.078	168.85(-
1993	28166	120	1.95	—	3.26	5.21	177.924	172.71(-
1994	28166	120	1.95	0.580	10.93	13.46	181.665	168.20(-
1995	28166	120	1.95	1.571	10.92	14.44	185.547	171.10(-
1996	85523 *	380	6.18	2.475	10.90	19.55	190.050	170.50(-
1997	85523	380	6.18	3.195	10.88	20.25	193.769	173.51(-
1998	85523	380	6.18	3.559	13.09	22.82	198.164	175.34(-
1999	85523	380	6.18	3.884	15.31	25.37	202.690	177.32(-
2000	85523	380	6.18	4.290	17.62	28.00	207.370	179.37(-

* Increase in the harvestable area is the result of institutional plantations becoming harvestable.

Compiled from Data Source - ORG Survey 1989.

The projection without considering the ecological aspects of forest coverage reveals that with the current rate of afforastation, plantation, deforestation and implementation of energy saving/conserving devices, existing forest resources, particularly of fuelwood, would be able to meet the consumption demand till 1992 and thereafter the situation would gradually deteriorate and by 2000 AD. the shortage of fuelwood be around 4.08 lakh tonnes.

Table - 11 : Demand-Supply Gap of fuel wood (Without considering ecological aspects)

(in lakh tonnes)

Year	Demand of fuel wood	Supply of fuel wood	Gap
1989	164.043	184.70	20.65(+)
1990	167.243	180.00	12.75(+)
1991	170.655	176.90	06.24(+)
1992	174.078	175.00	00.92(+)
1993	177.924	172.40	05.52(-)
1994	181.665	177.98	03.69(-)
1995	185.547	176.67	08.88(-)
1996	190.050	181.07	08.98(-)
1997	193.769	185.19	08.58(-)
1998	198.164	191.36	06.81(-)
1999	202.69	197.38	05.31(-)
2000	207.370	203.29	04.08(-)

In order to combat the apprehended fuel wood shortages, it suggests intensification of implementation of improved chullahs and bio-gas plants, as the increased rate of plantation may not serve the immediate future requirement due to inevitable constraint of gestation period. It has also estimated the number of these devices need to be introduced in order to completely eliminate the shortages of fuelwood in different years. However, considering the present level of implementation, such large number of these energy conserving devices is not serviable, it adds.

Table - 12 : Number of Chullahs and Bio-gas units required to meet fuelwood deficiency

Year	Improved Chullas	Bioplants
1989	24.7	4.26
1990	25.2	4.34
1991	25.7	4.43
1992	26.2	4.53
1993	26.8	4.67
1994	26.1	4.52
1995	26.6	4.59
1996	26.5	4.57
1997	27.0	4.65
1998	27.3	4.70
1999	27.6	4.75
2000	27.9	4.81

Source - Wood balance in Orissa, ORG, 1989

The ground reality is somewhat different from all these numerical exercises. While so much hope is pinned on peoples' participation, improved energy conservation devices, non-conventional sources, so far it has not shown any promise to relieve the burden on conventional sources and prevent, the destruction that goes with its use, except the peoples' own initiative (village forest protection etc.) to face the situation.

This kind of species in social forestry are not even producing leaves to collect.



Pix : Sanjay K. Khatua.

THE CHANGING SCENARIO : PROFILE OF COASTAL VILLAGE

In the densely populated rural coastal plain areas of Orissa, many parts of which never had forest nearby in the memorable past, people use diverse types of fuel-twigs, leaves, reeds, grass, creepers, roots, barks, cowdung, crop residue, agro waste - which are available in their environment and from their agricultural activities for cooking and other needs.

LEAVES, TWIGS, SCREW PINES : NO BAR FOR FUEL

Various types of leaves are used as fuel by villager. The major ones include bamboo, mango, jackfruit, date plam, palm, coconut, Chakunda etc. The people who have coconut trees use its bough and leaves as fuel and in some cases they sell the surplus. Use of split wood is rare. Less than 25% households use split wood occasionally, as it is considered a 'high status fuel type. Mostly, these are Chakundas or Jamun variety and is usually obtained from their backyard.

But on the special occasions, such as Sradha, marriage and other social-religious rituals the people irrespective of their caste and economic status use split wood as fuel. People who have no trees in their homestead land, purchase split wood from other people who have maore chakunda trees in their homestead land.

Twigs of mango, Chakunda, jack-fruit, Jamun and Karanja are used as fuel by the households who have these in their homestead land or in their orchard. Twigs/branches are collected during winter (at the time of preparing harvesting ground at the backyard) or during summer and stored.

The households having more bamboo bushes and banana bushes use their leaves as fuel. Jute stick (kaunria) is also a major crop residue used as fuel in the village. A grass variety locally called Bena, found on the demarcation lines of the low lying agricultural land is used as fodder and fuel, specially for boiling of the paddy in combination with straw & other leaves.

Cow-dung cake is a mojor fuel used in the village by all the house holds. In rainy season people use cowdung as manure but in other seasons they prepare cowdung cake. In rainy season the households who face fuel scarcity, prepare cowdung cake on their walls and pindas (to protect it from rain).



FUEL SCARCITY FORCES THE PARENTS TO SENT FOR COLLECTION. THE CHILDREN ARE DEPRIVED OF THEIR BASIC RIGHTS. PIX : SANJAYA KHATUA

Besides cowdung cake, cowdung sticks are prepared applying cattle dung on various sticks. These cattle dung sticks are easy to store and burn well, emitting less smoke.

PLIGHT OF MARGINAL AND LANDLESS FAMILIES

The landless and the marginal land owning Harijan and Sabarna households of the village use 'kia dhandi' (lower part of screw-pines) as fuel. Both male and female of Harijan Sahi go for mass collection of 'Kia dhandi' from the village common land such as pasture land, road side, funeral ground and canal side etc., for about 3 months. Due to over exploitation the screw pines, in some cases stand as fence to agricultural lands. Hence, land owners sometimes resent it.

The other type of fuel, commonly used by the landless Sabarna & Harijan families is Nakalam which usually grows on road sides, canal sides & in water logged areas. These give a foul smell while burning. To minimise it, people usually take the peel off before drying.

Some of the Harijan families of this village are basket makers. The bamboo over 'Anti' during basket making make excellent fuel for these families. The landless and marginal land owning families usually collect leaves of trees such as banyan, Chakunda and pipal which exist on the village common property, and in social forestry plantations. Some harijan households expressed that certain influntial person of the village resent their collection of twigs and leaves from the village commons including the social forestry plantations but they often fell trees from the plantation in the name of institutional work.

Near about 8 households of the village sell fuel (twig, cow-dung cakes) wood. Out of them 4 houseshold sell their surplus fuel and other 4 poor households sell their fuel for additional income, which they collect from village common lands and agricultural lands.



TO CONSIVE FUEL POTENTIAL, THE CREAPERS ARE TIED AND PROCESSED IN RANIPUR JHARIAL (BOLANGIR) AREA. PIX : SANJAYA KHATUA.

roots are dug and used as fuel or sold to the traditional village wood cutters at the cost of Rs.50 - Rs.200, who in turn sell it to the needy villagers, especially for cooking on special occasions.

IMPROVED DEVICES : POOR RESPONSE

It was observed that the villagers response to bio-gas plant and 'Unnata Chulla' programme is very poor. Though most households in the village made 'Unnata Chulla', all of them broke it as one of houses was set afire due to the chimney of the Chulla. There were other reasons too - that only split wood and twig wood could be used as fuel and the cooking process took more time than the traditional chulla.

As for the bio-gas plant, people complained that it did not operate efficiently. Some households use heater yet this was not convenient for big families.

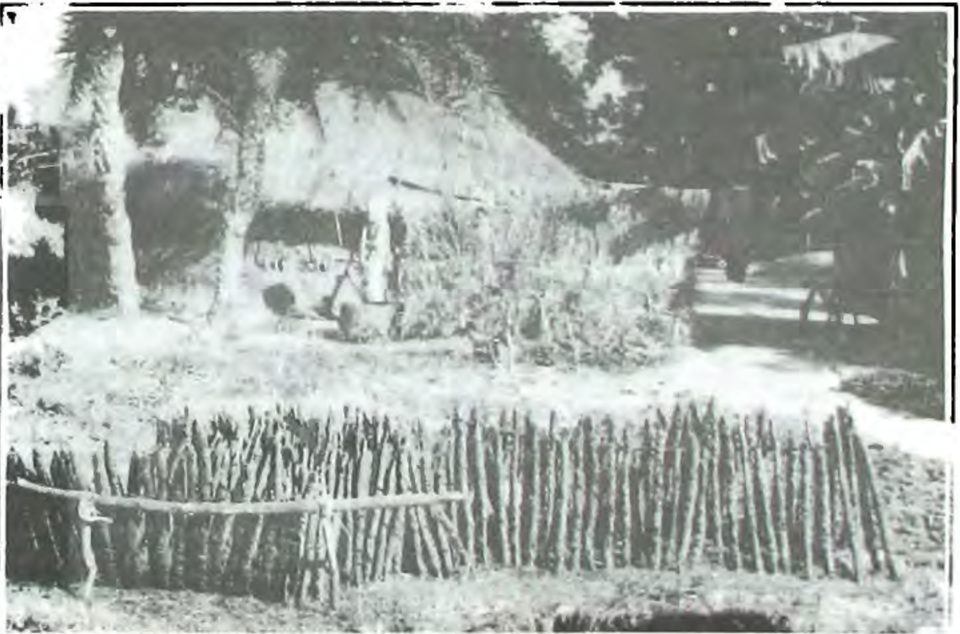
TRENDS OF CHANGE

Villagers tell that 40 years ago there was more common property in the village including common orchards. Trees such as mango, coconut, banyan, date palm and pipal grew in those common orchards. The poor people of the village used to collect fuel from those orchards with the permission of landlord. But after the abolition of 'Jamindari Pratha' the influential persons made 'patta' of the lands in their name and cut all the trees from the orchards.

Though the use of cowdung cake as fuel is an age old practice in this area the degree of its use has increased over the years due to growth of population and shortage of fuel collected from common properties and due to substantial reduction in jute cultivation, which used to be widely cultivated and was one of the major providers of fuel but is at present limited to a very small quantity following the low market price of jute fiber. At present, in place of jute sticks cowdung cake is being considered as the major fuel in the village.

The number of trees in the homestead land have decreased over the years due to extension of houses, family divisions and in a major cyclone that hit the area, 10 years back a large number of big trees such as mango, Tentuli and Chakunda were uprooted. Grown up trees face a threat from wood traders and agents who persuade people and give advances at the time of need to sell off their trees, which are needed for the recently operating 'ply wood support' mill in the locality (Who supply the thin sheets to Calcutta). The

"DUNG STICKS" - AN INDEGENOUS FUEL PROCESSING CRAFT. PIX : SANJAYA KHATUA.



NON-CONVENTIONAL/RENEWABLE SOURCES : KEY TO THE FUTURE

CONVENTIONAL ENERGY SOURCES : PROBLEMS GALORE

The present day energy requirements are met from mainly fossil fuels like coal, oil and gas, fuelwood, energy of the flowing waters, waste materials like cowdung cakes, farm waste etc. The fossil fuels are remains of plant material buried underground for thousands of years. Their reserves are, therefore, not unlimited. A recent global study conducted by the Shell Company has indicated that the proven and economically recoverable oil reserves will last only for 42 years at today's rate of extraction assuming consumption levels remaining unchanged. Gas reserves for about 62 years and coal reserves for about 180 years.



PADDY POST-HARVESTING TECHNOLOGY PIX : JAGADISH PRADHAN.

The availability of fuel wood has already became alarmingly precarious, the forest cover in the country is hardly 17-19 per cent whereas for wasteland to forest cover ratio, it should not have been less than 33 per cent.

Organic materials such as coal, oil, gas fuel wood, cowdung etc., when burnt produce many pollutant materials like waste heat, ash, fly ash, oxides, carbon, sulphur and nitrogen and other particulate materials. It is estimated that the energy industry alone contributes a global release of over 20 billion tonnes of carbon dioxide annually along with other pollutants. This is mainly responsible for green house effect contributing to the atmospheric increase in temperature.

Energy generated through the fission and fusion of atoms is viewed as one of the most important energy generation process for the future. However, the safe disposal of radioactive fission products worldwide still remains a problematic area besides the fear of accidents etc.

All these have necessitated a fresh look at alternatives. Biomass, Solar energy, Mini Hydel Power, Wind Geothermal and tidal waves cover the spectrum of the known alternative renewable resources. It is argued that while biomass and solar energy have a substantial potential to form a dependable resource base to fill the gap that may arise with fast depletion of world petroleum resources, availability and application of other renewable resources are location specific and can be exploited on small scale levels and more useful at remote areas, sphere infrastructure is not yet developed.



Biogas non-functional and the people are using agro-waste (dried) in Rampur-Jharlar area (Bolangir). Pix : Sanjaya Khatua.



SOLAR ENERGY USED BY PEOPLE ON DAY-TO-DAY LIFE
PIX : GHANI ZAMAN FOR CPSW.

SOLAR PHOTOVOLTAICS

Solar photovoltaics converts sunlight into DC electricity directly and instantaneously through electronic process. The basic building block is known as solar cell. These solar cells are made of semi-conducting materials, most common material used being silicon. A solar cell is made by introduction of known impurities into a high purity silicon wafer. When light falls over this silicon material voltage is generated. When the two surfaces of the solar cell are connected to a load, current flows. Typically, a silicon solar cell generates 0.5 volts and the current generated depends on the surface area of the solar cell.

SOLAR PHOTOVOLTAIC :
GREAT POTENTIAL FOR ORISSA

In Orissa Solar Photovoltaic (PV) programme has been implemented in addition to other renewable energy resources. A number of applications including solar cooker, street lighting, water purification, battery charging, TV operation and water pumping, etc., are being tried.

Orissa is situated at 21.0°N latitude and 85°E longitude. It receives solar radiation on an average 5 KWH/M²/day, approximately 272 sunshine days in a year and about 8-10 sunshine hours per day.

SPV : STEADILY BECOMING COST EFFECTIVE

Photovoltaic devices when made out of single crystalline silicon water turn out to be expensive compared to present day available energies because of high energy and material cost involved in growing single crystals of silicon. Worldwide photovoltaic module production was estimated to have increased from 5MW to 55 MW. Efforts have narrowed down the gap between the present cost per watt of PV power and the conventional electricity. Module costs have come down to a fourth of 1981 levels and to a tenth of the levels that prevailed in the mid-seventies through steady improvements.

The Central Electronics Ltd.(CEL)., has pioneered the development and commercial production of solar cells. Although the crystalline silicon PV technology has been receiving attention during the last 5 years, efforts made during the last two decades have resulted in the establishment of a research base and indigenous production capabilities for high purity silicon, silicon solar cells, modules and systems. Institutions in the country are engaged in research and technology development of amorphous silicon solar cells required for power generation at cheaper rates. The Ministry of Non-Conventional Energy Sources (MNES) is supporting a few selected projects to promote solar photovoltaic research.

There has been a joint project of CEL and NPL, New Delhi to set up an experimental facility to cast multicrystaline silicon ingots of 40-60 Kg. size and to develop a production - worthy process for making photovoltaic grade multicrystaline silicon.

WIND ENERGY : ORISSA'S POTENTIAL IS BEING EXPLORED.
PIX : EASTERN MEDIA, BHUBANESWAR.



SOLAR ENERGY

As the sun happens to be the source of life on our planet earth, it also happens to be the source of all energies (except geo-thermal and nuclear) available to mankind. The sun is a huge nuclear reactor where hydrogen gas is continuously burning at high temperature and pressure and generating energy. A small fraction of the energy radiated by the sun into the space is received on the surface of the earth in the form of radiant energy. This energy is also received in three main spectral regions; namely (i) ultraviolet, (ii) visible light and (iii) infrared or heat radiation; the energy content being distributed as about 2%, 51% and 47% respectively. From the point of view of the energy content ultraviolet radiation has no significance since most of the energy is concentrated in the other two regions.

The planet earth is covered by a blanket of a mixture of several gases, water vapours, particulate materials etc. However, this blanket is upto a certain height only, beyond which there is vacuum. The solar inszolation above the atmosphere and falling on a plane surface facing the sun is 1.35 KW per square metre. This is known as solar constant. Some portion of the solar energy coming towards the earth is either absorbed by the atmosphere or reflected back into the space. The amount of solar insolation available on the surface of the earth is therefore reduced, the maximum amount being in the range of 1 to 1.1 KW/m². This amount also does not remain the same during the whole day. As the earth is inclined at an angle of 23.5° to its axis, it is moving round the sun and also spins around its own axis, the amount of solar energy available changes with time of the day and season of the year. It also depends upon the sky conditions. In spite of these variations the amount of solar energy received on the surface of our country is about 5×10^{15} KWH/year which is an enormous amount of energy. Although plant, animal and human life exist due to the availability of solar radiation, solar radiation can also be used to generate energy in different forms for our day to day use. The most important routes of solar energy utilisation are through the conversion of solar energy into heat energy and directly converting the solar radiant energy into electrical energy utilising the process of photo-voltaic conversion.

Source : Dr. G.D.Sootha's Article, Yojana, Republic Day Special 1993.

SPV PROGRAMME IN ORISSA LACKS FOCUS

In Orissa, the Solar PV programme attained momentum in 1985, with installation of a number of solar PV lighting systems as demonstration kits. Besides, electrification of three villages by solar PV light in Gondia block of Dhenkanal district taken up by DNES, Government of India, in the beginning of the year 1985, the programme has been implemented by NCES Division of BHEL, Hyderabad. Subsequently, the installation of solar photovoltaic lighting system and other photovoltaic systems for specific application were taken up by OREDA.

By 1992 OREDA had installed 840 Solar cookers, 1139 SPV lighting systems, 75,030 LPd water heating systems and 730 LPd. desalination system. Other activities include powering of telephone exchange, Hybrid power plant at Ramachandi, SPV deep well pumping at Bhogra, SPV fencing at elephant sanctuary, SPV power pack for TV operation, SPV powerpack for VHP sets. Some of the new devices developed by OREDA include solar PV lantern, Solar Freeze, Solar PV water purifier etc.

Though, this is an area of emerging technology and the programmes have gained sufficient acceptance in remote non-electrified far-off areas where conventional electricity is a distant possibility, a number of these installations are reportedly lying unoperational due to lack of proper maintenance and people participation.

a) Solar photovoltaics, b) Solar photovoltaics great potential for Orissa

SOLAR DEVICES : YET TO GAIN ACCEPTANCE

Solar cookers could very well ease the rural poor's problem of cooking food. But this economically viable option that could meet 14 per cent of the country's cooking requirement has not caught on, despite a heavy subsidy. In all these years just 2.30 lakh solar cookers have been sold in the country (in Orissa only 840). "Despite the energy saving potential of the solar cookers, even those who have bought them stop using them when the warm wears off. Lugging the square heavy, solar cooker box on to a terrace or garden is cumbersome and there is not the requisite customer engineering. Very often the black point of the utensils wears off and consumers do not know where it can be redone" - observes Usha Rani (Ind. Exp. Jan, 6,1993)

"In Cyprus, 80 per cent of the homes have solar water heaters. In Israel, no building is given a completion certificate unless it installs solar water heaters. The solar water heaters have an electrical back up to take care of the days when there is no sun. India has more sunshine than Israel. But while in India domestic solar water heaters, cost about Rs.5,000/- (and no running costs thereafter), consumers do not know where they can get one and how it should be installed".

ALTERNATIVE ENERGY USE CANNOT BE ESTIMATED AND PROVIDED BY STATE EFFORTS. PIX : JAGADISH PRADHAN.



OREDA ENERGY CONSERVATION -TIME FOR ACTION

The Orissa Renewable Energy Development Agency (OREDA) took over from Agriculture Department in 1984, the task of conservation and generation of power specially from non-commercial fuels and renewable sources of energy. Presently, OREDA has been engaged in implementing various programmes as named below :-

- National Programme on Biogas Development (NPBD).

- Waste-Recycling Resource Recovery System (WRRRS) including Community. Biogas Plant and Institutional Biogas Plants (CBP/IBP)

- Solar Thermal Extension Programme

- Solar Photovoltaic Demonstration and utilisation programme

- Wind Mill for pumping

- National Programme on Improved Chullah (NPIC)

- Bio-mass

- Mini Micro Hydel Projects

- Appropriate Rural Technology

Intensive implementation of energy gadgets under the umbrella of URJAGRAM and Integrated Rural Energy Planning (IREP) Programme, in selected and needy blocks and villages is the other important step taken up by OREDA.

CONVENTIONAL ENERGY SOURCES : ACHIEVEMENTS OF OREDA

Year	Bio-gas Plants constructed No.	Solar Cooker No. sold	SPV Lighting systems No.	No.of Chullahs installed	Water heating system in Lpd.	De-salination system in Lpd.	Gassifier/Stirling Engine installed No.
1979 - 85	6,167	—	—	—	—	—	—
85-86	5,338	115	—	35,405	27,115	75.0	—
86-87	4,310	231	41	30,263	6,765	162.5	—
87-88	6,005	118	177	37,023	10,100	92.5	1 No. (6KW) 3 Nos.(15HP)
88-89	9,227	44	123	46,154	9,200	170.0	3 Nos.(18HP) 3 Nos.(15HP)
89-90	15,606	18	156	62,963	3,000	25.0	1 No. (6KW)
90-91	12,697	114	256	92,245	58,000	45.0	—
91-92	8,650	200	386	99,890	13,000	35.0	—
	68,000	840	1139	4,03,243	1,27,180		

Compiled from data sources : Orissa Review Nov. 1992.



DROUGHT POWER PLAYS AN IMPORTANT ROLE IN HILLY AREAS.PIX : JAGADISH PRADHAN.

MINI-MICRO HYDEL GENERATION

In India our ancestors used energy from small water sources for grinding grain for centuries. Indian technologists developed mini-hydel systems more than 100 years ago, but in the post-Independence period emphasis on the new "temples of modern India" - huge dams and power stations - mini-micro hydel systems were neglected. In 1989, however, hydro projects below 3 MW were transferred from the Power Ministry to MNES (Ministry of Non-conventional Energy Sources) because it was felt that small-scale systems need to be dealt with differently.

Small Hydro Power (SHP) plants which generate electricity on small scale in a few KW to MW range are now being made attractive through standardisation and better planning and management to reduce initial cost and commissioning schedules.

SHP PLANTS IN ORISSA : STILL IN INFANCY

Power generation has been possible where perennial water flow (river, stream, canal) with a minimum water head of 2 metres exists. Many hilly pockets of Orissa are endowed with such potentials. The detailed survey of such potentials is being explored throughout the state. The SHP plants are a useful renewable energy source of decentralised power in remote and hilly regions isolated from main grids but endowed with hydraulic resources.

Orissa Govt. has taken up the execution of mini/micro hydel projects to boost generation of power. One such project at Barghagra with an installed capacity of 40 MW was commissioned in 1986 by OREDA. Another project at Bisoi distributary (Sunei) in Mayurbhanj district is under execution by OREDA. Seven more projects, namely Barboria (2 x 325 KW), Kendupatna 2 x 250 MW) and Biribati (2 x325 KW) in Cuttack district, Banpur (2 x 150 KW) in Puri district, Andhribbangi (1 x 325 KW) in Bolangir district, Barbhangi (2 x 1000 KW) in Ganjam district and Badanala (2 x 325 KW) in Koraput district are being executed by the Orissa Power Generation Corporation.

IS SMALL COST EFFECTIVE ?

Efforts, at realising the vastly untapped potential of hydel power in the country, are hampered by lack of private investment. The potential of small hydro power in the country has been estimated at nearly 5,000 MW, but only about 86 MW have been realised. Of this, about 25 MW is from micro hydel schemes. In the Eighth Plan, a capacity of 256 MW is expected to be added, of which about 70 MW will be in the hilly areas of Himachal Pradesh, east Uttar Pradesh and northeast India.

However, to go by the present installation cost the SHP is expensive. Till recently these have been shunned because of a belief that the 'smaller the size, the higher the cost'. On the face of it, this is true. In some small hydro schemes in the Uttar Pradesh hills, the cost of power supply ranges from Rs. 30,000 to Rs.60,000 per KW, whereas coal based thermal plants, it is as low as Rs.10,000 per KW.

However, the environmental cost of carbon dioxide emissions and waste disposal is not reflected in the cost of thermal power generation. And, with pressure increasing on fossil fuels, small hydro is emerging as a clean and renewable source of power, especially for remote areas.

Source : Down to Earth, August 31, 1993.

So far, 120 micro/mini small hydel schemes (up to 3 MW capacity) totalling about 86 MW have been installed in the country. One hundred and seventeen schemes aggregating about 125 MW are presently under construction. The 8th Plan proposals envisage a capacity addition through such schemes of about 200 MW.

IMPROVED CHULLAH

In 1989, 50 per cent of the total energy consumption in the country was from biomass fuels namely wood crop residue and dung cakes. Between 2004 and 2005 it is estimated that biomass fuel consumption will go up to 300 to 330 M tonnes of fuel wood, 192 to 221 M tonnes of crop residue and 90 to 104 M tonnes of dung cakes.

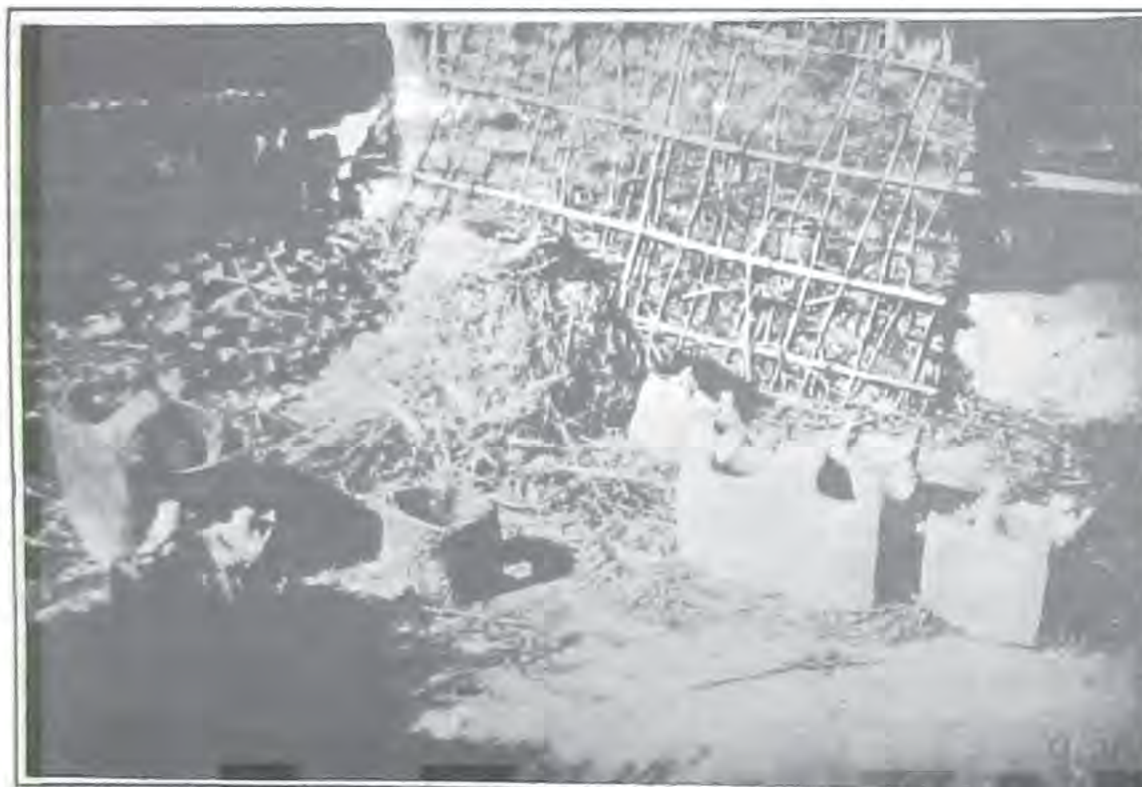
In 1983, the national programme of improved chullahs (NPIC) was initiated by the DNES to conserve and optimise the use of fuelwood in rural areas, to create and train a work force of rural women to construct improved cook-stoves and to keep improving the designs.

The improved chullah with a thermal efficiency of about 20 per cent were to be installed in large numbers in selected villages of India. The programme was initially lunched as a demonstration project and was subsequently converted into a National Programme from April, 1985. Today there are around 40 approved designs and by March 1992 some 12.5 million stoves were installed in the country.

UNNATA CHULLAH : DO THEY REALLY SAVE FUEL ?

The Conventional stoves which mainly use fire wood as fuel, have proven to be 5 to 10 per cent thermally efficient. Apart from heavy consumption of wood, the smoke that comes out from such stove burning, is harmful for the eye and chest. Bio-medical Sciences have come out with sufficient proof that this smoke prevents the development of the brain of a child who is less than 2½ years. Keeping conservation of wood as the main goal as well to keep the environment clean and better, OREDA implemented till date 4.03 lakh of improved cook stoves which are smokeless and fuel efficient to a tune of 25 per cent.

The saving of fuel wood per unit of improved chullah per annum is estimated to be 440 Kg. Though OREDA claims that through this programme it has been able to save 1.20 lakh tonnes of wood, 240 Ha. of forestry from deforestation, the ground observations do not match with the claim. The beneficiaries complain that the design is not suitable to cooking practices and the type of fuel used by them. Especially in the areas where people use assorted fuel they find it unoperational. There are several instances of mass demolition of chullahs following fire hazard out of the chimney.



INDIGENOUS CHULLA FUEL SAVING. PIX : JAGADISH PRADHAN.

Unnata Chulla - A new variety



Pix : Jagadish Pradhan

ground of the chullah was dug. The mouth became narrower and round shaped. The inside depression of the Bhuin chullah at present is 1 to 1.5 ft. As people told, this type of chullah is more economical than the chullah made on the floor without ground depression. In the previous chullah more leaves were burnt due to wide mouth and it was filled with ash quickly (as they were without ground depression). At present 70 per cent households of this village use this type of Bhuin chullah.

In some Garjhat areas narrow mouthed chullah are found with provision to hold 3 pots at a time. But it is appalling to see the amount of wood fuel that goes waste because of the type of chullah put to use and the careless attitude of people in close to forest villages and innumerable roadside hotels and tea shops.

INDIGENOUS UNNATA CHULLAH EXPERIMENTS

In bio-resource stressed areas the indigenous research and development (R&D) is working overtime to develop appropriate chullah and fuel management, keeping in pace with the change in type and degree of availability of fuel.

The make and design of the chullah depends on types and quantity of fuel available and used in a particular locality. As the variety and fuel affluent families vary from region to region, different types of chullah are found in different parts of rural Orissa. It varies from just a dépression on the ground and some provision to hold the pot to carefully designed ones on the basis of experience to minimise fuel consumption.

Evaluation studies conducted by the Tata Energy Research Institute showed that only 50 per cent of the improved chullahs were in use. Sixty percent of the chullahs function efficiently for a year or two and then are discarded. Because of their faulty construction the maximum energy saved was 20 per cent. Many improved chullahs, instead of saving energy, were actually guzzling energy in some cases.

The chullah programme should be learnt from the experiences of the ingenious experiments carried out by women of different parts of Orissa-'sticks, rolls and plaits' of different combinations, hearths of different types and designs in order to reduce the amount of consumptions, reduce the cooking time and most important is to make the assorted varieties of fuel manageable.

As times changed and over exploitation of the forest began, people faced difficulties in getting wood fuel of their choice. In place of split wood they changed to twigs and became careful and economical about consumption. A new type of chullah having single mouth and provision to hold two pots at a time but without any depression inside was developed. This chullah was found to be economical on fuel consumption, as at a time two pots could be put to use. This type of chullah were mostly made by the general caste households, when ST households of the village continued with the old type.

Again the time came when even the twigs became scarce and people mostly depended on leaves obtained from protected forest as fuel. This necessitated a change in the chullah design once again. People began to make 'Bhuin Chullah'. The inside



Pix : Sanjay K. Khatua.

Animal Energy In Post harvest Operation.

BIOGAS : BOOM FOR RURAL AREAS

Biogas is a sustainable source of energy by virtue of its production from vastly available cattle dung, simplicity of construction, operation and maintenance of the production units, and multiple benefits accrued at the macro and the user level.

It is said that biogas could be the answer to the country's deepening energy crisis which besides being a non-polluting energy source, also provides enriched manure and improves local sanitation and health standards.

Bio-gas consists largely of methane gas and it is produced through the anaerobic fermentation of cattle dung and other organic wastes. It is an energy option in rural areas, affected by high oil import bills and growing deforestation. A number of family and community biogas plants have been installed and today India is second only to China in the extent of its biogas programme.

However, a limitation of biogas is its dependence on cattle dung. As a result, a technology meant to help the weaker sections of society, with limited access to a variety of resources, has resulted in most bio-gas plants being owned by the rich.

VAST POTENTIAL

Estimates indicate a potential of setting up of about 40 million family type biogas units in the country based on ownership of a minimum of four heads of cattle. However, a potential of about 12 million units is considered to be realisable in a time span of 10-15 years, with the likely development of new single design based an leafy biomass, crop residues, garbage, weeds etc. This potential would get enhanced. However, so far, over 1.64 million biogas units have been set up in the country, which represent harnessing of about 13 per cent of the realisable potential.

The annual rate of construction of biogas units has increased tremendously from the level of 10,000 plants in 1980 to about 1,80,000 plants at present. The Ministry of Non-Conventional Energy Source (MNES) is continuing implementation of the National Project in Biogas Development (NPBD), which was started in 1981-82, as a centrally sponsored scheme.

Several government and voluntary agencies are involved in disseminating biogas technology. The Department of Non-conventional Energy Sources (DNES) under the Union Ministry of Energy is the nodal agency in charge of the National Programme on Biogas Development (NPBD). DNES has adopted a multi-model, multi-agency approach. It installs plants suited to local conditions and works with NGOs and state government officials upto the district level.

ORISSA EXPERIENCE

In Orissa, OREDA monitors the entire biogas programme in the state with the support of Department of Science, Technology & Environment. It is implementing the programme in the districts through District Rural Development Agencies (DRDA). Local voluntary organisations are also involved for promotion and construction of biogas plants on turnkey basis.

Out of seven types of approved models of biogass plants only three types of plants are mainly constructed in Orissa. They are fixed dome type (Janata & Deenbandhu model) and floating dome type (KVIC) model. The sixes from 2 cum. to 4 cum. are mostly accepted. One kilogram of cow dung mixed with one liter of water produces 0.04 cum of biogas. For 2 cum. sized plant 50 kg. of cowdung and 50 lts of water are required daily, the availability of which is very crucial for the functioning of the plant.

The gobar gas plants are not free of problems. The following problems are usually identified in smooth operation of the plants installed in Orissa - leakage in dome in case of Janata model or gas holder in case of KVIC model, development of cracks in biogas dome (Janata model), partition wall in KVIC model sometimes collapses, shortage of cow dung etc.



WASTAGE OF DUNG RESOURCE AND DEPRIVATION OF CHILD RIGHTS. PIX : SANJAYA KHATUA.

NEEDS MORE CARE

Despite these constraints, biogas programme, if implemented properly has the potential to reduce stress on the vegetation in the village surrounding and make life of women little easier. Workmanship and post installation services needs to be strengthened and it needs to be linked to livestock development programme more specifically development of grazing lands and fodder production. While Biogas research and development programme aims at 5.8 per cent enhancement of bio-digestibility of cattle dung and other organic wastes, doubling the gas production rate and environment of manurial value - are aspects that need to be considered seriously.

RENEWABLE ENERGY : THE KEY ENERGY SECTOR OF THE FUTURE.

The renewable energy sector is seen as the ministry of the nation's future power requirements and is all set for major expansion, following a significant infusion of funds. Ministry of Non-conventional Energy Sources (MNES), Minister of State Shri Krishna Kumar, noted that "renewable energy is the key energy sector of the future".

Action Plan : The ministry's action plan aims at a power generation target from non-conventional energy sources of 2,000 MW by 1996-97 from the present level of 200 MW, says Krishna Kumar, "We have been going at a slow pace because of the paucity of funds, but help from international donors is on the increase. The Global Environment Facility (GEF) will eventually have a corpus of $3 billion and we hope to get a sizable share of this". The ministry's efforts are being lauded internationally and Andre Peers, British Petroleum Solar representative in India, says, "There is a sea change in the outlook of MWES. It is actively campaigning for commercialisation of these technologies".

RENEWABLE ENERGY, A SCENE FROM ULUNDA AREA OF KEONJHAR.
PIX : SANJAYA KHATUA.



Experts say increasing conventional energy production means hiking a crude oil import bill that reached Rs.16,000 crore in 1992-93, aggravating deforestation and displacement of people to cater to huge hydroelectric products and increasing environmental degradation from use of coal.

RAY OF HOPE

India's annual potential of non-conventional energy Potential

Wind energy	30,000	- 50,000 MW
Small and mini-micro hydel	5,000	- 10,000 MW
Biomass	17,000	- 60,000 MW
Solar energy		-5,70,000 MW

Source : Ministry of Non-conventional Energy Sources

High Potential : Caught unprepared by the OPEC inspired oil crisis in 1973, the leading energy consuming nations, began exploring renewable energy options. At present, studies indicate that about one quarter of global energy comes from renewable sources.

Because of India's vast territory, varied geography and different agro-climatic conditions, its renewable energy potential is high. At present, such energy forms only 1 per cent of country's total energy production. The MNES Minister of state, Krishna Kumar says, "Our aim should be to hike this to 10-15 per cent by 2010". Ministry officials explain, "The primary reason for the low share of renewable in total energy production has been the low investment by the government in the sector". They disclosed that less than 1 per cent of the government's energy outlay is on renewable sources (excluding hydroelectric dams).**SOURCE : Down to EARTH, May 1993.**

Bio-mass - Neglected Renewable Enegy Source :

As per the estimate of the Orissa State Electricity Board (OSEB) in Orissa about 5,00,000 agricultural pump-sets are to be energized and the requirement will be about 1200 million units per year. Considering the present shortfall in demand and supply, if every sector depends only upon the electricity in the conventional way, proper justice can not be done to any of the energy consuming sectors and as a result development will suffer. Hence, time has come to find out areas where unconventional and

decentralised means of supplying energy can be adopted. Biomass gasification has the potential of lessing the load from the conventional sector. It can supply high grade energy, both electricity and direct mechanical powers, especially for agriculture and other sectors. It can also offer options for both centralised and decentralised power supply system, though decentralised option is more logical.

Scopes for Biomass Gasification :

Any biological matter containing cellulosic matter and is more or less dry can be considered for gasification through thermochemical conversion processing, generating producer gas which contains carbon monoxide and hydrogen as the combustible ingredients.

Every year, plants convert about 200 billion tonnes of carbon into terrestrial and aquatic biomass through photosynthesis. The equivalent of the products of synthesis is 3,000 billion giga joules. This is about 10 times the total energy being presently consumed in the world annually. Only a seventh of the world's total energy comes from biomass. A large and potentially renewable resource is thus left largely untapped. The annual biomass availability in India is estimated to be over 200 million tonnes from agricultural residue alone.

B.C.Jain, director of Ankur Energy and Development Alternatives, Vadodara, points out, "When a programme of bio-mass production is coupled with its conversion for energy purposed there is no net carbon dioxide release as is the case with conventional power generation. This aspect is very well recognised the world over & this technology is recommended as one of the few options to arrest global warning".

There are two potentially very attractive areas of application : irrigation water pumping, where currently diesel pump sets are used, and industrial applications both in conjunction with diesel generating sets as also for direct thermal applications.

The cost of electricity generation from a gasifier system may work out to be hundred per cent higher compared to conventional generation. But because of the lower capital cost and the possibility of running experts dropping with design improvements, gasifier systems, may prove to be cost-effective.

Bio-mass Experiment in Orissa : Poor Presence

The National Productivity Council's survey in the year 1985-86 shows that about 159 lakh tonnes of crop residues and about 16 lakh tonnes of agro-industrial waste were available. Out of these about 45 to 50 lakh tonnes are suitable for gasification. If 10 to 15 lakh tonnes of these are gasified, the irrigation requirement of Orissa can be met. OREDA has designed wind gasifier to gasify the types of agro-wastes available in the state of Orissa. So far, eleven Gasifier/Stirling engines have been installed. During the 8th Five Year Plan period state govt. has a target to generate 350 KW of power through gasifier.

WIND POWER GENERATION : IN ITS INFANCY

Orissa is blessed with a coastal belt as well as other windy pockets of about 500 Kms. in length and about 220 Kms. in breadth OREDA is engaged in the assessment and utilisation of the wind energy potential of the state through projects sponsored by the Department of Non-conventional Energy sources (DNES), Government of India.

Wind monitoring carried out by OREDA reveals that the coastal belt of the state has moderate to strong (15-20 Kmph) wind speed on an average. It was also observed that in coastal Orissa the mean monthly wind speed exceeds 10 mph during 60-75 per cent time of the year. The annual mean wind speed was observed to exceed 8 mph for 4-5 per cent time of the year. This shows that the popular 12 PU 500 type wind pump can operate for nearly 70-75 per cent time of the year along the coastal belt of the state.

The feed-back and evaluation on the 322 wind mills installed so far show that the installed design of the wind pump is not suitable. The Development wing of OREDA has been busy in innovating a new design suiting Orissa's climate for harnessing wind power. Technology leading to wind power harnessing in the country in general and in the state in particular is in it's infancy.



IN DRY AREA OF BONGAMUNDA, FUEL COLLECTION CAN BE REVERSED. PIX : SANJAYA KHATUA.

PEOPLES INITIATIVE : LEAVES KEEP THE CHULLAHS BURNING

While various government sponsored energy generation programmes receive lukewarm response from the people, it is heartening to note that all over Orissa, in many remote pockets, people have began to protect their village forests to get fuel, timber and other produces of day to day survival and income generation. Some studies suggest there 'would be 2,000 villages protecting about 150,000 ha. village forest.

Kainsi is a village in Keonjhar block, of Keonjhar and only 20 km. away from the district headquarters. 30 years back the village was surrounded with dense forest. At that time the fuel wood was so abundant that the valuable log woods such as Sala, Mahula, Phasi, Asana Dhaura, etc. were used as fuel by the villagers. In winter logs burned in living rooms and animal sheds for relief from cold. But soon massive exploitation of forest began by the urban wood traders. They came to the village and established relations with influential persons of the village and cut log woods from village forest. When this process continued, the villagers thought in any way, one day their village forest would be finished. So why would not they also take their share people competed with each other in fieling trees.

But the Adibasis (about 50 per cent of the population mostly Munda) did not like to join the mad rush and finish off their forest. So in a bid to save at least their share, they demanded that village forest be divided and the forest was divided into two parts - Adibasi jungle and 'Non-Adibasi jungle'. The non-Adibasis finished off their jungle and trees/plants from their agricultural land. They dug out the roots of the trees for fuel. But that did not last long. Then they began to use Nakalam, cowdung, straw and a preparation of straw and dung as fuel. Some purchased fuelwood from Jhumpura (18Km. away from the village.)

First the Adibasis of Kainsi used Sal leaves which they collected from their share of village forest, as fuel and non-Adibasis purchased surplus leaves from them. To solve the fuel crisis both non-Adibasis and Adibasis got united and met the local forester to allow them to take care of the nearby Judipada reserve forest, which was in degraded state and in exchange of that take the dry leaves. The forester agreed and since 1978 the villagers have been keeping watch over the forest through a watchman appointed and paid by the villagers. The degraded Sal jungle has regenerated and the villagers have been collecting dry leaves since 6-7 years.

Fuel leaf collection is a unique feature of this village. Sal leaves fall in early summer. The 'Grama Sabha' fix a day for fuel leaf gathering. Persons from each household go to the forest on the fixed day. All sweep leaves from the forest and collect the leaves in heaps. The collected leaves are then distributed equally among all the households.

In the year 1984-85 the village found out that Social Forestry Department was making plantation on village common lands of nearby 'Khai tangiri' area. The villagers got inspired and in the village meeting decided to make plantation through social forestry people.

However, the repeated sweeping of the protected forest floor for dry leaves threatens the very existence of the forest. No solutions to this problem have yet been found !

SUCH COLLECTIVE EFFORTS OF FOREST PROTECTION, MANAGEMENT AND DISTRIBUTION OF HARVESTS A GREAT HOPE FOR FUTURE.
PIX : SANJAYA KHATUA.



SOLUTION TO ENERGY CRISIS : ENTAILS HONESTY OF INTENTION AND WILL POWER

Much of the world's supply of cheap oil and gas has already been exhausted. By 2030, futurists forecast that most oil reserves will also be depleted.

In today's world, for any kind of development, energy is a prerequisite. The hike in oil price in 1973 and once again 1979 forced the attention of developed countries towards energy conservation measures and possibility of exploiting alternative energy sources.

In Orissa, despite the vast potential for renewable sources of energy, their commercial exploitation at present is very negligible. Just to go by the statistics, OREDA with its energy conservation and non-conventional energy programme (achievement in improved Chullah, gobargas, solar cooker programme) has not yet reached 10 per cent of the rural households of our state. The actual use and sustainbility of the installations are much lower. The other non-conventional energy programmes are yet to come out of the experiment/demonstration phase.



IN THE NEW SITUATION, WOMEN WILL GET MORE LEISURE TIME AND BE SAVED FROM DRUDGERY. PIX : SANJAYA KHATUA.

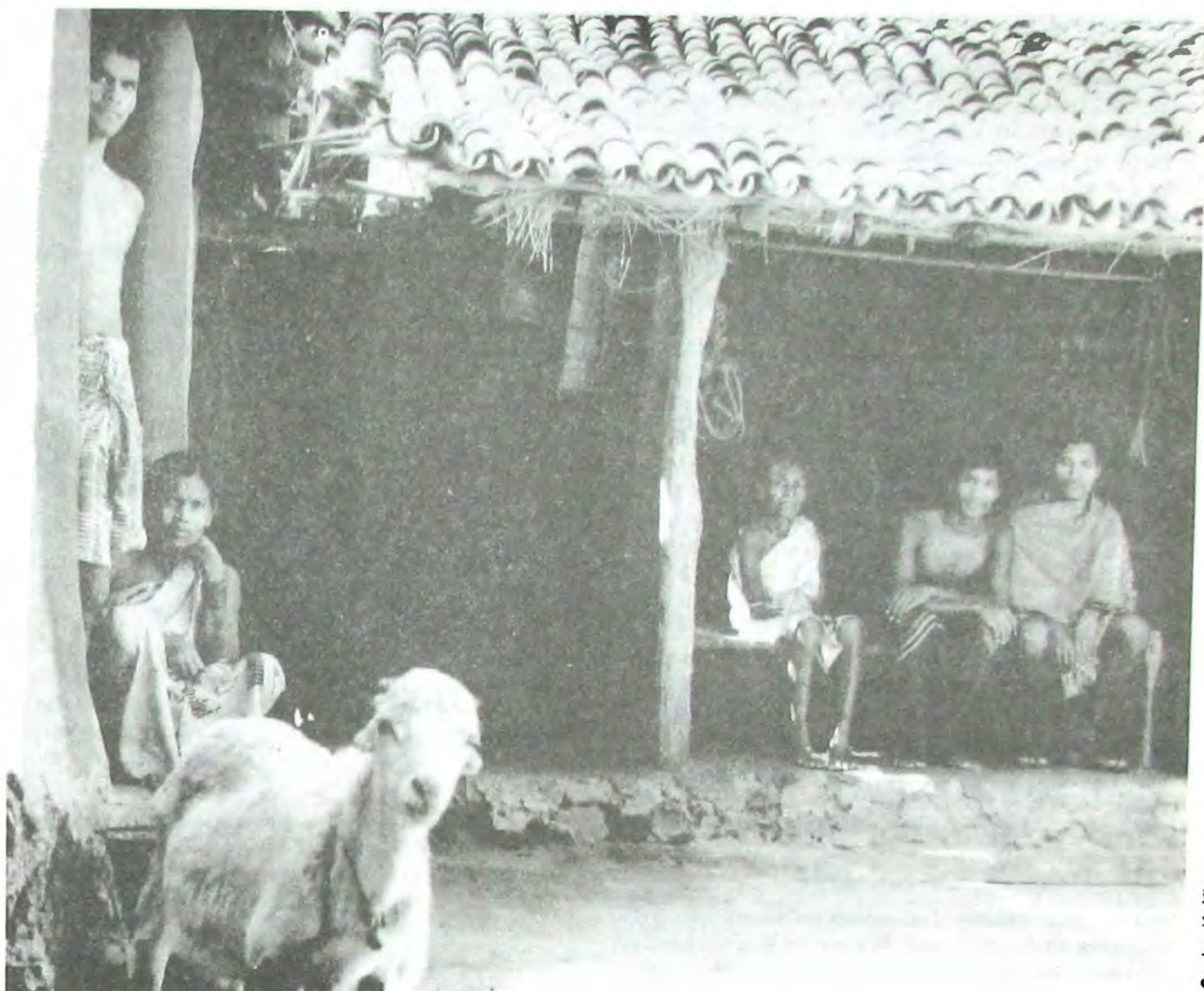
The right kind of atmosphere to accept and use the non-conventional methods is yet to be created. The programme seriously lacks enthusiasm and committment. Non-govt. organisations are often harassed in many ways which result in loss of interest and hence programmes are implemented in a matter of fact manner. The post installation services for various programmes is very poor and there are not many skilled persons in the rural areas to help perpetuate the impact. Another major reason for low utilization rate is the lack of women's involvement, who in reality are responsible for their careful use in the implementation of the programmes.

It seems that the daily power cut has come to continue for ever. This may further aggravate due to gradual silting up of the reservoirs and increase in the demand. While it is yet to come out with any solution to the pollution problem in the Talchar area caused by the Thermal plant, govt plans to install few more thermal power plants with foreign collaboration. Awarenessregarding the conservation of the fossil fuels is yet to catch up in Orissa.

As it is getting clear that in near future none of the present non-conventional energy options are going to replace the biomass dependancy for domestic needs of the rural areas, more emphasis is to be given in their clean, sustainble and optimal use and ways need to be found out for the access of landless and marginal farmers to these resources.

Adequate research should be addressed to find out acceptable practical ways/devices that would use minimum energy, make the work easier, cleaner and efficient in various energy applications in day to day life of rural areas.

Our concern for the environment saving forests from denundation, destruction, keeping the air free from pollution should match with our effort to tap non-conventional renewable energy. This entails certain amount of honesty in intention, sustained and concerted effort. The day to day energy need of the teeming population can not be met till the ad-hoc technology based attempts are pushed on people which often lacks innovation in the implementation strategy. This should learn from peoples' own initiatives to tackle the problem in their indigenous ways and should have enough flexibility to adopt to the varied needs of the people and their life styles and make optimum use of the varied potentials existing in their surrounding. More over, this should form part of over all development of environment of a particular region.



Pix : Sanjay K. Khatua.

Housing is becoming an acute problem in rural Orissa. One family gets only one room - even that is not possible.

HOUSING

HOUSING : THE DEAREST DREAM, DISTANT REALITY

To have a house on one's own is perhaps the dearest dream of man today. Since time immemorial man has been relentlessly trying to make his living place safe - from various natural and supernatural elements-rain, wind, wild animals, ghosts, spirits and keep it pleasant in different seasons, make it look nice and durable.

In Orissa, traditionally, each house construction is preceeded a long and complicated procedure of selecting the right kind of site (Suddha Bhumi), determining the right orientation of the house (moda), finding out auspicious days to initiate work, etc. which are considered necessary to keep the houses free from evil spirits and enhance the ayu or life of the house. In most part of the state these activities are performed as per the advice of the Jyotish, Jani or the persons who are experts in Silpa Shatra, the traditional house construction manual..

TRADITIONAL HOUSE BUILDING MATERIALS : CONTINUED DEPENDENCY

Orissa presents a wide variety of house types, having distinct characteristics in design, layout, decoration, make etc., reflecting the socio-cultural life style, aesthetic sense of the people of different regions. But, the design, make and the aesthetic, to a large extent, are influenced by the traditional house building materials available in that region.

In rural areas of Orissa, dependency on traditional building materials is almost complete - 74.4 percent of the rural houses have their roof made of grass, leaves, reeds, thatch, wood, mud, unburnt brick and bamboo; 17.8 per cent are made of tiles, slate and shingles. Similarly 10.63 per cent of the houses have their wall made of grass, leaves, reeds, bamboo; 71.95 per cent are made of mud; 3.08 per cent are made of unburnt bricks.

The area-specific characteristic in house construction has stemmed out of the socio-cultural habit prevalent in a particular region, topographic and climatic condition of that area and to a large extent, the variety and extent of bio-resources available in that region. While in Cuttack, Phulbani, Balasore districts more than 90 per cent houses have thatched roof, in Dhenkanal, Puri, Ganjam, Koraput, Mayurbhanj more than 80 per cent of the houses have thatched roof and the rest of the districts represent a considerable use of tiles, slate, shingles etc. as roofing material, Sundergarh having the highest (78.45) per cent of houses made of these materials.

This variation in roofing materials is directly or indirectly related to the type of crop residues and other materials available for roofing for help in manufacturing the roofing material. For instance, in non-intensive paddy cultivation area, where straw is in short supply for thatching, but fire wood is easily available to fire tiles, khapars, etc., their use is higher.

Similarly, the availability of various types of bio-resources is also reflected in making of the walls. While at the state level walls of 11.54 per cent of houses are made of grass, leaves, reeds, bamboo or wood and their use in Phulbani, Kalahandi and Koraput districts are comparatively higher (39.60 %) that is 20.03% of the total houses in the state, 3.08 per cent and 9.91 per cent of the houses have their walls made of unburnt bricks and burnt bricks, respectively. Interestingly, Sambalpur represent the highest use of unburnt bricks (16.10%) and the lowest use of burnt bricks (0.05%) used for wall making. Ganjam represents the highest percentage of houses using burnt bricks for walls (26.32%) followed by Bolangir (15.26%). About 1.65 per cent of houses of Orissa have their walls made of stone. Puri district represent the highest percentage of houses using stone for wall making (4.62%) followed by Dhenkanal (4.43%).

The urban areas of Orissa also represent a curious mix of traditional and modern housing materials. More than 47 per cent of walls and 38 per cent of roofs are made of non energy consuming materials such as grass, leaves, reeds, bamboo, mud, unburnt bricks etc.

Rural & Urban Housing - In Critical Transition : At present, the housing activities both in rural and urban areas are subject to various kinds of push and pull and stand on a cross road. While the state already had a considerable population having no homestead land and house of their own, the population increase and the division of joint families has necessitated substantial quantities of additional housing facilities, while the maintenance and renovation of the existing houses has become increasingly difficult owing to depletion of traditional house building material and the escalating prices of modern house buildings materials which is beyond the reach of many. At the same time, the large scale migration to urban areas for employment has created serious housing problem and given rise to number of slums. The non availability of traditional house building materials has also restricted the traditional ways of building houses.

The housing shortage and improper accommodation has seriously affected the quality of life and has serious implications at macro and micro level. In order to properly understand the housing problem and its impact on the socio-economic life, it is imperative to know the traditional house making styles prevalent in different parts or Orissa.

Varied House Types & Lay Outs - Break Future !

In Orissa, layout of the houses are influenced by the socio-economic condition of the people, their occupation, socio-cultural habit, availability of space and above all, the type and extent of availability of house building material.

The house types commonly seen in the coastal areas are known as 'Khanja Ghara'. The living rooms and other utility spaces are arranged around a open courtyard, agana. But at present due to family division this 'Khanja Ghara' is gradually disappearing from the villages and converted to Dandighara, these are without courtyard.

In most of the coastal villages 'Khanja Ghara' are found with straw thatched roofs and the houses are made with strong roofing infrastructure to run for a longer period. As the coastal villages are frequently affected by cyclones and collection of house building materials is expensive and labourious, people usually make strong houses. In inland areas, the well to do people make strong and fabulous Khanja Ghar fully utilizing the advantage of the easy availability of wood. Use of plentiful heavy wooden materials is very common in these houses.

In many parts of Orissa, in villages, houses are seen adjacent to each other and located on both sides of village road with no significant gap found in between the houses.

In this type of housing lay outs the main entrances of the houses are from the village road side which is known as 'Dhand pata' and the back side of the houses are known 'Badi Pata'. The back side is the most used space to carry out the routine day to day activities. Cow-shed, fuel shed and husking pedal shed, etc. are located at the badipata. The open space contiguous to the immediate back of the house is known as 'Khalabadi' the harvesting space. In some cases 'Khalabadis' are located at a separate place and the cowsheds and fuel sheds are seen there. These 'Khalabadis are considered as potential sites for house extension in case of family division or additional housing requirements.

In many villages of the former Cuttack and Puri districts the entrance rooms of most of the farmers families are used as animal shed. They believe that, this way they can come in contact with the sacred cow dung every day, which is the symbol of purity, and they can look after their animals, which are considered as the partner of their livelihood.

Mud House was constructed by the forefathers. Due to scarcity of House Construction materials simple maintenance is difficult, what to talk about its development ?



Pix : Sanjay K. Khatua.

Khalabadi are rarely seen at the backside of the houses. Less amount of homestead land coupled with frequent family division render these clusters very congested and unhygienic.

In some forest/upland and coastal villages double storied thatched and khapar houses are found. In these cases the ground floor is made with wooden beams, planks, bamboo and mud or brush wood and mud.

Several tribal communities have the habit of making peculiar temporary houses. Nomadic Mankadia tribes make hut made of leaves. In Ganjam district the Matia community make temporary houses made of bamboo, reeds, leaves and thatch. These one room cone shaped houses do not have any wall. All the tribal communities have their distinct style of house making which are cent percent dependent on the bio-resources available in their area.

In some villages a typical type of housing arrangement is seen. The houses stretch on both the sides of village road, one side is used for living purpose and the other side is used as animal shed. This has been the age old habit with the villagers as they believe that it is a good omen when the south wind beats against their cowsheds.

In the villages of Ganjam district a peculiar house design is seen. Here, houses are constructed on narrow rectangular strips with rooms arranged in a line without any side windows, resulting in very bad lighting and ventilation. Owing to family divisions houses are getting narrower - at many places houses are constructed on narrow strips measuring less than 8' in width. In flood prone and hilly areas houses in villages usually do not follow any systematic pattern and are seen scattered all over. In these areas houses are constructed on high plinths with narrow, deep meandering to lanes.

In many close to forest villages also, houses are located in different clusters, scattered in different directions of the villages. Here in many cases, the amount of homestead land per household is comparatively greater and at the back side of the houses more open space is found. Separate fuel shed/straw heaps etc. are found on wooden platforms in the back side of the house. Here in many cases animals are kept inside the living houses, or inside the living house premises. This has been the habit to save the domestic animals from the attack of wild animals. The villagers are of the opinion that the wooden platform are necessary to save fuel, hay etc. from termites.

In many parts of Orissa, in villages, the houses of the schedule caste community are usually located in a separate cluster, at a distance from the main habitation. Usually, no systematic housing arrangement is seen in these clusters. They possess comparatively less amount of homestead land, hence open space or

In many parts of Orissa, people traditionally do not own any homestead land. In Puri district, in many cases the Bauris and Bhois live in the coconut orchard of the landlords and in Ganjam district, in many pockets, people live on 'Sahukar's land'. In exchange, they share crop their land or work for them. The CPSW Village Environment Appraisal team came across a case where all the households (60) belonging to Kalinji (farmer) community in village 'sahukars' land and cultivate their land since many generations.

Apart from the living houses various kinds of temporary houses are made for varieties of use like - Bagichaghar (orchard house), Pala (watch house), Ghasighar (cowdung cake shed), Jalaighar (fuel shed) etc. All these are made of locally available bio-resources.

The varied layout and house types which reflect peoples wisdom, the age old practice, benefit, occupational utility, optimum utilization of available resources and peoples' access to them are under severe threat and all fronts on one hand the house types which in many cases are very scientific and appropriate is at present difficult to pursue due to space problem and problem of getting enough building materials. On the other hand, the house types, which was the victim of the then belief, social custom and restrictions, which now requires a change, is getting increasingly difficult for the above set of reasons. The implications are far reaching and the solutions are yet to be found.

MAKE OF THE HOUSES : CRITICAL DEPENDENCE ON LOCALLY AVAILABLE MATERIALS

"Uva Tala, Pota Sala - Ghara kariba HentalaGharaku Gharani Chetuala - Se Ghara Chaliba Aparakala"

This Oriya proverb says - such house where Tala (palm wood) is used at the upper portion, (as it fails against termite) Sal is used as pillar (as it stands against termite) and the trellis and thatch is made of Hental (mangroove species) stem and leaves, and where the wife is watchful and vigilant, that house would run for long years. From many years of trial and error and experience they have perfected various house building styles and know the inherent qualities of different building materials and how to get the best out of them.

In the coastal plains and other pockets of Orissa, plenty of long growing paddy is cultivated and the houses are usually thatched with paddy straw. In the areas where paddy straw is not enough for thatching or the socio-economically poor families who do not own much cultivable land, as substitute, people use various grasses - Chana, Bena, leaves of coconut, plam, date plam, hentala, sugarcane tops etc., for thatching. In close to forest villages people use various alternative thatching material-grass, leaves etc., procured from the forest.

Similarly, material for roofing infrastructure and other components of house, till today, are collected from within the area. In distant to forest villages though people do depend on forest based supply lines to some extent (wood depots), still the bulk of the supply is obtained from the local vegetation. In coastal plains bulk of the supply from within the area consists of bamboo, palm coconut trunk, planks of Amba, Panasa, Sirish, Jamun, Chakunda etc.

About 30 years back, mangrove forests of Cuttack and Balasore district were the major source of obtaining house building materials for the nearby villagers. The infrastructure used to be made with Sundari, Bani, Hentala - the mangrove species. The Katia creeper and Hentala leaves were used as rope and thatch. These materials are very strong and durable and have proved strong enough against the saline water and three major cyclones in the last 3 decades. Almost total forest from a large coastal tract has put the local populace in enormous difficulty in obtaining house building materials. In the flood plains Jhatimati walls are found in many cases. Jhatimati consists of a material made of split bamboo, twigs, thorny branches, reeds etc. daubed with mud at both the sides. This reinforced walls give good resistance to flood water and can be re-erected easily.

In close to forest villages the occurrence of houses with khapar tile roofs and burn bricks clay mortar walls is comparatively greater, because of their comparatively easy access to fuel wood to fire the Khaparas and bricks. The poor households of close to forest villages also make Jhatimati walls with branches, twigs, reeds which are available in the forest. However, it is observed that the housing infrastructure of these areas, especially of poor families, are made of immature logs which are prone to pest attack and necessitate changing of roof infrastructure at regular intervals (cooking inside the house is preferred to save it from pest as they do not like smoke).

In both coastal plains and inland areas the houses of the socio-economically poor families are in most cases very temporary in nature, made on very limited space with low quality materials. Kudia ghar, Chalighar or Pala ghara, etc. as these houses are known, made so, because in coastal areas access to housing materials is difficult for these people. And in close to forest inland areas this is due to carelessness as the materials are/were available easily and to some extent a continued socio-cultural habit from the days when village administration was in the hands of Gountias and the kinds, who imposed various rules and regulations on collection of house building materials and these families were not expected to have a decent house. And at present, in the changed situation, it is only the resourceful and influential who are able to smuggle out matured trees.

For walls also, besides the commonly used mud, a host of other locally available materials such as laterite, sand stones, spools etc. are used. Till today, in many places people use locally made genguti chuna made from Khalimati as a substitute for cement.

Make of the House - Too many Local Variations :

The rural housing types in Orissa vary from place to place and are influenced by the local materials available in the area, the socio-economic condition of the people and their socio-cultural background. The bulk of construction in rural areas is accomplished with materials, such as, bamboo, wood grass, thatch, stone and mud.

In the past, these materials were available in abundance and therefore the people could afford to live in and maintain such houses. But, with the increase in population, the demand for such naturally available materials has gone up and they are gradually getting out of reach of many, The following are a few cases on the make of the houses from different regions of Orissa.

Kalabadis : Village in Mayurbhanj :

The region of northern Orissa spreading out from Baripada, Bangriposi to Jamshola Ghat is an area where a lot of stone construction is taken up in the rural areas. The stone used in the rural housing in the village is known as "Patali" or "Chepta". This is a stratified sedimentary sandstone which is available in the nearby Mahalisar Hills.

The stones are in layers and the mortar used is mud. Thickness of the walls varies from 12" to 15". The lintels are made of the same stone. The stone in single piece is used as columns. The foundation is made of the same stone placed in stepped formation. Plastering in the better quality of housing is done with cement and sand plaster. In poorer houses, it is either plastered with mud or left exposed. The roof covering is sometimes of clay tiles, A/C sheet or plain thatch roof. The flooring is usually done with mud since these stones do not give a smooth surface to be used in floors.

Tamando : Village near Khurda.

The laterite range is spreading over Khurda, Bhubaneswar, Chowduar, Athagarh, upto Dhenkanal, and hence this stone is used plentily in local construction. Laterite is generally soft when excavated and can be cut and dressed into blocks with simple tools. On drying, these blocks harden as a result of dehydration and other chemical changes and can be handled like any other stone for masonry.

Houses are made on locally available laterite stones which is plentily available in many parts of Orissa due to its peculiar geological formations.



Pix : Sanjay K. Khatua

Laterite has been used at the Tamando village for walls, columns and lintels. The sizes of blocks they use is 8" x 18" for the construction of walls and the sizes used for lintels and columns are a maximum of 4' long and 7' long respectively. Most of the houses have used mud as material for the masonry work. Sometimes permanent materials like cement have also been used. The surface of the blocks are not very rough and therefore they are usually left unplastered in the exterior of buildings.

The roofing materials is clay tiles, A/C sheet or plain thatch. The floors are of mud and the plaster is finished with a red earth smearing. In this type of shelters the stone used is quite permanent.

Village in Keonjhar

Spools are available in pockets all across the Ghat areas of Orissa. Spools are stones which are found naturally and which come in sizes of 6" to 1'6". They are rounded in their edges. Spools are also found abundantly in the river beds and stream of Orissa.

1'-1'-3' Random rubble wall construction is made of these spools and mud is used as mortar. The joints in this kind of construction have large quantities of mud since they have to make up the bigger voids created by these undressed stones. Lintels are made of wood. The roofing materials used is thatch and flooring is of mud.

Chhanbulus : Village in Dhenkanal

This is an area which fallsin both laterite as well as Kaolin region. Besides it is close to the forest areas. There are several such type of situations spread out all over Orissa. Due to the availability of forests and the abundance of mud the local people make their houses out of "Jhati-Mati"

Jhati-Matti consists of the construction of a fence like structure made of split bamboo, twigs, thorny branches, reeds covered with mud on both sides, so that the mud wall is reinforced. The load of the roof is normally brought down to the ground with the help of a system of beams and posts made of wood or bamboo. The roof has thatch covering and the flooring is made of mud. (Based on article by S.K.Mishra, Deptt. of Architecture, CET, OUAT, Bhubaneswar. Source : M.K.Home of Orissa Environment Society).

Locally available bio-resource material has several other uses in house making and its protection. In many places to protect mud walls from basing rain, "tatis" made of various leaves are use. Fuel shed and other temporary protection thatching is done with various grasses and leaves. Wattle made of bamboo and twigs are tied on roofs to protect the thatch from wind. Gainchi mats made of grass, reeds, etc., are used as alternative doors for cow-shed and inner rooms. Various kind of Tati, wattle covered with palm or other leaves are used as room separators. bamboo mat is spread on the floor of cow-shed to keep it dry. For similar reasons, logs and twigs are spread on the floor in close to forest villages. Twigs are also used to make bhadi, platform to store various things.

While the alternative to traditional house building materials is not at sight, the sources of procuring these materials are systematically destroyed due to lack of foresight and numerous man made follies. The critical dependency on locally available house building material is yet to be properly understood by the planners. While much importance is attached to the use of locally available materials in the govt. sponsored housing schemes, there is hardly any effort for generation, sustainable use and management of traditional house building materials.



Pix : Sanjay K. Khatua.

"Khapara" made house, mostly found in West Orissa and other parts also.

SPACE AND FACILITIES : CRUCIAL FOR QUALITY LIVING

Houses have multifaceted function - it provides shelter, space for working, storage of grain and other resources and above all a place for all the family members to lead a healthy life. Hence, only walls and roof over it can not be called a living house. The pattern of housing which developed through the ages was determined by rituals, aesthetic and functionalism based on due considerations to climate and geographical factors, socio-cultural needs and availability of resources. Since more than 80 percent of the population live in villages and the state's economy is predominantly agrarian comprising people with varied socio-economic status and socio-cultural needs, the housing structure varies in different regions, communities and the facilities and utility spaces are greatly influenced by the socio-economic status, socio-cultural habits, occupational needs and availability of resources in the area.

The typical Khanjaghar usually accommodates a Baithak Khana (drawing room), number of sleeping rooms, a store room, Amar (grain keeping space), langhas, kitchen, Duar (courtyard). Langhas are used for all sorts of daily activities - cooking, dining, sitting, and varieties of other household activities. In some cases the Dhenki, husking pedal space is also found in the langha. At the entry of the house lies the Pinda or raised plinth projected by nearly one metre. In cases, where water table is high open well is also found in the courtyard. Various other utility spaces like Guhal (cow-shed), fuel/crop residue shed, ghasichali (cowdung-cake shed), etc. are found at the backyard.

At the central place of the Khanjaghar, the court yard is found. The court-yard is mostly used for family activities and interaction between family members. In the corner of the courtyard a washing space is found and an under-ground drain leads to backyard from that place is known as 'Jala Muhani'. In the central place of the court-yard a hearth is found and used as cooking place in winter and summer seasons. The courtyard is used for a varieties of activities and serves as the hob centre of the day to day life of the family. Family members also sleep there in summer. In case of divided joint families separate hearths are found in different places of the courtyard. In some cases the courtyards are divided into separate sections by temporary wall and fence to accommodate the divided family.

Khanjaghars are gradually disappearing from the village under population pressure, division of joint families and the scarcity of house building space and materials.

As evident from the above discussion open space or social space found inside the premises or at the periphery of the living houses - courtyard, langha have comparatively greater utility value than the rooms. Similarly, the pinda or verandahs have multiple use.

At the entry of the house lies the pinda or raised plinth projected by nearly one metre from the wall surface. In coastal and inland flood plain areas the height of pinda is higher than upland and forest areas. Front pinda is more wider than the back pinda. The front pinda is used for sitting in morning and evening, jute fiber twisting, mat weaving, playing cards and other games, children's reading and also usual sleeping in summer. Sometimes distant relatives and guests are also received and treated on the pinda. Besides this, pinda is mainly used for keeping agricultural implements, fuel and Banamati (Special soil for smearing), etc. In some villages where housing problem is acute and most of the households have only one room their family members spend most of the time in pinda.

In 'L' type 'Dandi Ghar' (without -courtyard but with langha) other two sides are covered by boundary walls or fence. This space is used for day to day activities just like in the courtyard. Over the ages, people have devised and perfected various ways to store things properly and neatly utilizing the economy of space and also protect valuables, grains from fire and other natural elements.

In bio-resource plenty coastal and inland areas people make Atughar, Dhabaghar - mud ceiling supported by beams & bamboo or wooden plank platforms. This is used to store things& at some places it is used as the last floor and this protects valuables on the ground floor from fire hazard. In some areas this space is used to dry boiled paddy in rainy seasons. In close to forest villages, in case of thatched roof, a separate room, specially made with wood, bamboo & mud, called Agni bareni (fire protector) is used as storage room to save the valuable articles & grain from fire. However, at present the making of Atughar has became a difficult proposition owing to general depletion of bio-resources in these areas.

People also make Amar, grain storage space made of planks or bamboo, twigs and wattle daubed with mud. Under this, in many cases people have Noli, a series of depressions of 1 1/2' deep where Arum and other seeds are stored. At strategic places people also have decorated thana, holes on walls where various things of frequent use are kept. In cases, where housing and homestead land problem is acute separate cooking places are not found - sleeping room is used for cooking, storing, dining sleeping etc. Socio-economically poor and many tribal families manage all their activities in single room accommodations including keeping the animals.

In many a villages, housing is so congested that it is hardly sufficient to accommodate routine activities of all the family members at a time. Hence, many members are forced to spend their time outside most part of the day. CPSW Villages Environment team found in many villages per capita housing space for about 40 percent of the households is less than 35 square feet. The artisans usually have special arrangements to serve at their work place. In case of potter households, a separate 'Chali' (without walls or walls built to short height) is made in the backyard or front yard for making of pots and in some cases this Chali is used as cow-shed at night. In upland areas, weavers have typical working place in their house known as 'Parchi'. Parchi is a wide and long specious langha inside a Dandi Ghar which is occupied with handlooms and in some cases people sleep there at night.

Similarly the blacksmith, basket makers, stone carvers, etc. usually have separate work place to pursue their occupation. Adequate space & proper facilities is very crucial for leading a healthy life & scarcity of these can steal the pleasure of living & can have far reaching implications on the upbringing of the future generation, as in many cases grown up people are found to hang out at villages market complex and clubs etc. due to problem of adequate space & facilities at their homes. Considering the population increase, limited housing space and the ability of people, may be the time has come to plan out the villages and devise appropriate and functional housing plan, utilizing the economy of space and material and making them affordable and acceptable to the needy.

TRIBAL HOUSING : DISTINCT STYLE AND TOTAL DEPENDENCY ON NATURE

Orissa has a substantial tribal population and each tribe has its distinct style of house construction. Till today tribal housing is fully dependent on the locally available materials. However, owing to the depletion of bio-resources in their surroundings, in many pockets it is getting increasingly difficult for the tribal communities to construct and maintain their houses. The house construction style of five major tribal groups of Orissa gives an interesting insight.

GADABA

Population : 50,000 (1981) Largest concentration : Koraput.

HOUSE DESCRIPTION

It is a cylindrical house having a conical roof supported by a Sal post ('Dharani Khunti') which is approximately 18 feet long. It is firmly planted on the ground at the centre of the house. From its end several trellis of bamboo or Sal poles of 2" dia and 15ft. long run across the circular wall. These trellis are kept in position by trying them with narrow bamboo poles or splits radially by bark of a creeper called Siali. It is thatched with "Piri", a type of locally grown wild grass. It has a very narrow verandah running around the house. a door of 4.5 to 5ft x 2.5ft. is fixed to the circular wall. It is generally made up of jack fruit timber and opens into the inside of largest of the three apartments of house. Two other apartments are very small and have no doors. One of them is always kept empty. There is a hearth in this portion. Some earthen pots are kept here. The hearth and the pots are used for cooking food on ritual occasions. Food is never served in this room. The room adjacent to it is kitchen. It has a hearth and a earthen platform which runs along the circular wall almost upto the entrance room. a make shift raft is just hung over the hearth from the roof. This serves as a grain storage space. Kitchen and the living room have got air vents of 1.5" dia. Living/entrance room has a door. The fowlpen is situated in a corner near the door. This has a grinder, wooden mortar fixed to the floor. The inmates sleep, dine and do their household works in this room.

JUANG

Population : 27,000 (1981) Largest Concentration : Keonjhar

HOUSE DESCRIPTION

The Juangs at present live in permanently established villages which are located either in the foot-hills or in the valleys not far from sources of drinking water. A juang hut is generally rectangular in ground plain. It is about 15ft. long and 12ft. wide. A single door is provided in every hut without any window. The walls are made of wooden poles and is plastered with red earth. The roof is thatched with locally available grass. Inside the house a place is set apart for the kitchen to one side. It is here that food is cooked and water stored in pots. At the doorway the mortar is stuck into the ground where food grains are pounded by means of a wooden pestle. In some houses a courtyard is there in the front. The most conspicuous hut in a Juang village is the dormitory for bachelors where all the unmarried boys of the village sleep at night.

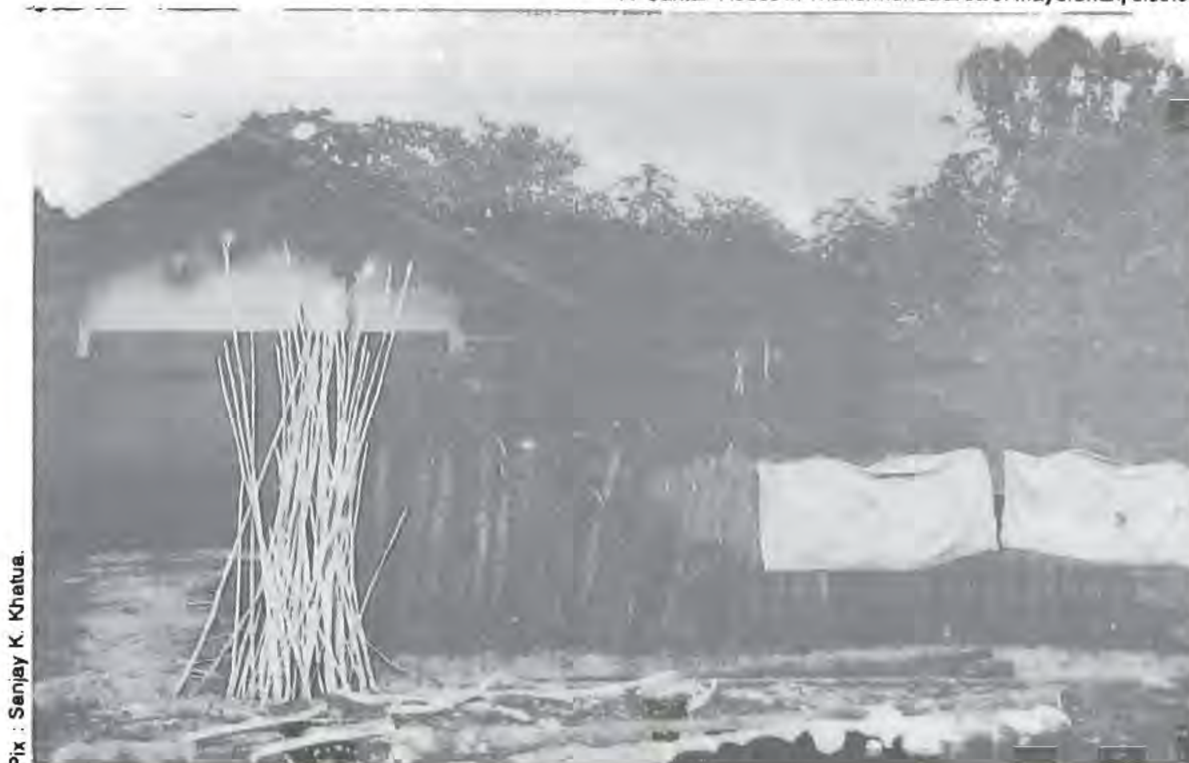
KONDH

Population : 9,00,000 (1981) largest tribe. Major Concentration : Central and Rayagada section of Koraput and Phulbani.

HOUSE DESCRIPTION

House types vary from place to place. But the generalized type is thatched with grass and the walls are made of wattle plastered with mud. The roof is so low that the walls are practically invisible from outside and one has to stoop down to get into the house. A narrow verandah is provided both in front and at the back of the house. Every Kondh house is single roomed with a partition separating a small portion of the house for cooking meals and storing water. On the opposite side of the kitchen a platform is constructed to store food grains, leaf-plates and cups and other household articles. The room is only about 5' to 6' high, for immediately above there is a loft with an opening kept in some convenient place to allow entry and storage of household goods and grains. Above the loft is the slanting roof.

A "Santal" House in Thakurmunda area of Mayurbhanj district.



Pix : Sanjay K. Khatua.

Another tribal house under thatching.



Pix : Jagadish Pradhan

SAORA

Population : 4,00,000 (1981) Major Concentration : Ganjam, Koraput

HOUSE DESCRIPTION

The Saoras build their huts at the foot-hills where convenient level grounds are available close to the hill streams. The plinth of the house is raised high to allow free drainage. The Verandah in front is wide enough for the members of the household to sit and spend time gossiping and attending to some household works such as husking grains, making ropes and mats. The main room which is used for sleeping serves as a passage from the front to the back of the house. A portion of it on the inner side is set apart for cooking meals and storing water. There is a loft made of wooden planks on this portion. The hearth is under this loft and the house wife crawls in every time she has to cook food. The floor of the main room has mortar in which corns and grains are pounded by means of pestle. A portion of the main room alongside the rear wall is set apart for keeping water pots. In one corner of the house near the hearth is the place for the family deities.

Two doors are provided, one in front and the other at the back of the house. Along the passage from the front door to the back door a wooden mortar is fixed where the food grain is pounded by means of a wooden pestle. A cow-shed is constructed at the back adjacent to the house. The pigstag and goatpen are provided in the cow-shed. But the fallows are kept in a corner inside the main house.

Source : Status of Tribal Housing in the state of Orissa by S.D. Sharma and K.Rayaguru, College of Agricultural Engineering Technology, OUAT, Bhubaneswar. (My Home : Orissa Environmental Society).

SANTAL

Population : 5,00,000 (1981) Major Concentration Mayurbhanj, Balasore, Keonjhar.

HOUSE DESCRIPTION

The Santal house is very attractive with spectacular multicolored paintings and drawings. The roof is either gabled or hipped. It is generally built on rectangular or L-shaped ground plan.

The size of house vary depending on economic condition. Generally they are 22.5 to 30.5ft. in length and 8.5 to 12.5ft. in width. The walls on all sides excepting the gabled portion of the side walls are 8 to 10' in height. The gabled portion which is triangular in shape is only 3 to 4' high. A partition wall separates the kitchen-cum-sleeping room from inner compartments where the ancestors are worshiped and grain bins kept on a raised platform.

The cow-shed and the goat pen are built close to living house. The walls are made of mud or sundried bricks. On the front side of the house a wider verandahs and on the remaining three sides narrow verandah are constructed. The roof is thatched either with straw or khapar.

Even in remote tribal areas, asbestos is supplied for house repair.



Pix : Sanjay K. Khatua

VENTILATION : ALSO VICTIM OF BIO-RESOURCE DEPLETION

Lot of importance is attached to sanitation and hygienic condition of the living house. Ventilation facilities play a considerable role in creating a healthy living place. In different parts of the state people have their indigenous ways and conception of ventilation. The choice of having proper ventilation facility, at present is also not free from the impact of depletion of house building materials. In many coastal and inland villages the houses stretch in both sides of the village road in east-west direction. main entrance door to the house faces the village road, in some houses another separate door is seen, which is meant for the 'Baithaka Khana'. The courtyard door opens into back lanes, also used as second entry by women of the family as is the typical of Orissan culture.

The sleeping units usually face south to catch the prevailing south wind. The open courtyard in the central place of the 'Khnjaghara' make the rooms ventilated. The doors and windows of ideal Khanjaghara are made with wooden frames and planks. In the case of adjacent houses, window is not found in the east west directions but where there is a gap between two houses window is found in east-west directions, but it is a rare case in coastal villages due to its congested and contiguous housing pattern.

However, many of the Khanjaghars also do not have windows for fear of theft, snakes and to protect privacy. In many inland and close to forest villages and in case of Chali Ghar the houses do not have any windows. Instead, they have one main entrance to the house and in the place of window small holes are found in the wall, which is known as 'Jalakabata' and often found closed with bundle of cloth or sack.

Ventilation situation, even in the Khanjaghar, is getting worsened day by day, as these are getting divided and separation walls are coming up in the courtyard. In many Harijan clusters housing pattern is so unsystematic and congested that it prevents light and wind for adequate ventilation which creates health problems. In some villages housing is so congested that it is difficult to find a thread inside even during day time without help of light.

CPSW Village Environment Appraisal team reports in river side village Walipur in Gania block, the houses are located at both sides of the village street and in a contiguous stretch without any gap in between, while the entrance hall is used as animal shed, separate 'houses' are constructed under a common roof having common walk. They have their hearth on the common passage which goes in front of the series of one roomed houses. The rooms have no windows what so ever, and it requires help of light to find something inside.

The housing problem is so acute in this village that the grown up boys sleep at the village school at night. Sleeping on the outside verandah is a common phenomenon in this village. Though awareness for ventilation has increased, in the changed situation many a household are not in a position to have adequate doors and windows, as now a days, these things are either not made or made strongly and it costs a lot. The socio-economically poor households who either due to social practice or due to carelessness did not have proper doors and windows (even in close to forest villages) when building materials were available and managed with temporary bamboo made doors and tatis, gainchis (mats made of grass reed etc.), at present find it difficult to have proper windows and doors which are beyond the reach of many following the depletion of local house building materials and the resultant price hike.

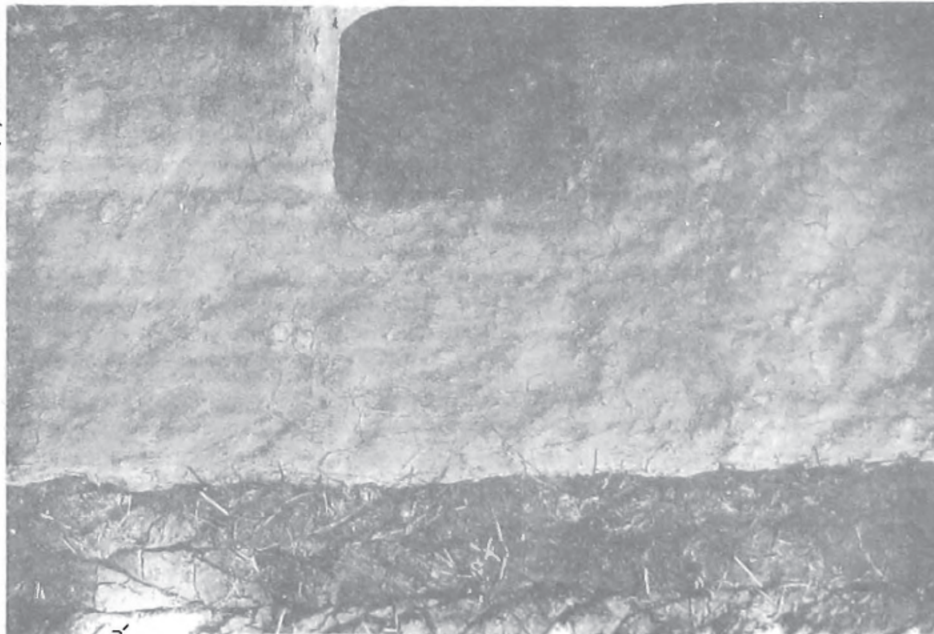
While people are being aggressively motivated by government and non-government agencies to have properly ventilated hygienic houses while offering no alternative, the traditional solution is gradually wiping out of hands of many.

MAINTENANCE : ALSO NOT AN EASY TASK

Traditional houses are required to be taken care off and maintained regularly in order to maintain sanitary and hygienic conditions and enhance their lifespan. Here also, the availability of different varieties of bio-resources plays an important role. Maintenance of Kachha houses usually comprises of thatching, change of Khapars, repair of walls and other exteriors and time to time change of roofing infrastructure.

The thatching style varies as per the type and availability of thatching material. Where thatching material is scarce different techniques are adopted to get the best out of it. Where paddy straw is abundantly available the thatch is thick and is changed every year, some also thatch it in Bengali style - using only good straw having the top portion down ward. It requires more amount of straw but lasts about 3/4 years.

The standard thatch of paddy straw requires to be changed annually. Straw and bamboo are the major materials required at the time of annual thatching. In the areas where paddy straw is available abundantly people go for a thick thatch and during annual thatching use more amount of new straw and less amount of old straw from the previous year. In these areas even the landless and marginal land owning families manage to obtain their straw re-



Pix : Sanjay K. Khatua.

Consciousness for ventilation is lacking. This is a kind of ritual to leave this much space.

One family in one room. Even Annual thatching is so difficult !

Pix : Sanjay K. Khatua.

quirement either from share cropping or from harvesting others paddy (they get bundles of paddy in kind as wage). However, things are getting difficult in many pockets high yielding paddy cultivation. In extensive areas, supply of thatchable straw has been substantially decreased as these variety of paddy grow shorter and do not have the ability to withstand water. Bamboo has also become very costly - a medium sized bamboo costs 40/50 rupees. This has put the socio-economically poor families in a very difficult situation and many are not able carry out annual thatching.

Khapar roof also requires maintenance at regular intervals - change of broken Khapars and replacement of the damaged roofing infrastructure. Besides yearly thatching, minor infrastructural repair of houses are required to be carried out at regular intervals - which requires bamboo, poles etc. Many are not able to carry out these regular repair owing to scarcity of once freely available house building material and the present cost of materials which is beyond the reach of many.

In close to forest villages, in many cases roofing infrastructure needs to be changed every 5/6 years as they are made of tender logs and twigs. This recurringly requires huge amount of poles and twigs. Bulk of the thatching material in this region also consists of forest produces. This age old habit of changing the house building infrastructure regularly and their dependency on forest produces for thatching has put many in trouble following the large scale depletion of forest resources and also as the access to the materials has become difficult.

All over Orissa the mud-walls and verandah are ritually repaired after the rainy season in the month of Aswina and Kartika. The houses are also smeared by mud and cowdung mixture at the time of various rituals and festivals. This work is normally done by the women folk. However, at present, in many pockets, due to environmental degradation, women are so busy in collecting materials of day to day survival that they have hardly any time left for proper maintenance and decoration of houses.

In some upland and drought prone areas where people migrate to distant places in search of livelihood, houses do not get proper attention and gradually crumble down beyond repair. In inland areas of Orissa, especially in tribal pockets, over the ages people have perfected a very special way to give the mud wall and floor a kind of resilience to fight out natural elements like rain and the wear and tear of day to day use, as well as give them gloss and better finish. This is achieved by a special way of compacting earth and smearing it with a paste prepared of soil, cowdung and burnt straw and then polished with stone and bark of selected trees. To decorate, they also use a special kind of Rangamati, coloured soil, obtained locally.

The mud walls and other interior and exterior parts of the houses are often decorated with beautiful motifs as part of regular decoration or part of numerous rituals and festivals. But to sustain all these artistic expressions there has to be a properly maintained house and lot of leisure time both of which, unfortunately are under serene stress following wide spread environmental degradation.

At present, it is common to find 10/20 per cent of the houses in most parts of Orissa in a very bad shape with blown off thatch, broken trellis, peeled off wall, which give many a families sleepless nights during rainy season. It is high time that something is done to make available adequate traditional house building material devise & disseminate ways to make the different components of the house last longer and easy to maintain.

PROBLEM OF EXTENSION : TO WHERE AND HOW

Population increase and family divisions has considerably increased the house construction activities in the recent years. It is also a fact that those who can afford now prefer to have their houses with more open space with vegetation and pond etc. within the homestead land, instead of sticking to the ancestral houses in congested clusters and utilising the common facilities. Houseless and socially backward families take advantage of the complicated land laws and encroach the village commons, govt. land and construct their houses. In the thickly populated areas new houses are found everywhere by the side of connecting roads, prime agricultural land, village commons, orchards, in all directions of the village. In certain areas, construction activities have increased to such an extent that the habitations of villages are becoming almost contiguous with each other. In this process the baditala jami, the prime agricultural land back side/near the habitation becomes the first causality.

In most of the cases family members keep on growing but the housing space does not. Rather it decreases following family divisions. As a result, students and young people find it difficult to spend time in their houses and are forced to spend time in village clubs, Kothaghar, schools (after school hours) or are found loitering at village square, market complexes. In many a villages, it is now a problem to provide proper sleeping accommodation to old and unmarried family members. As in 1/2 room accommodation it is the married persons who get the first preference - while the old persons are accommodated in makeshift arrangements in the langha or inner verandahs, while young men sleep at outer verandah or Kothaghar or clubs etc.

Many families in small space. A slum life in rural villages. People are unable to do annual maintenance.



Coastal villages are thickly populated and the division of ancestral homestead lands had come to its climax. In the case of family division, at first the household articles are divided, then the house, homestead land and the agricultural land. Ancestral houses being congested most of the divided families prefer to shift to road side, or canal sides if they own any land over there. Sometimes this involves lot of expenditure in developing homestead land out of the agricultural land.

The backyard of the houses or Khalabadis are extensively used for house extension purposes and in the process the Kitchen garden or the open social space behind the house is quickly disappearing. Due to reduced backyard, many households now use village commons as harvesting ground.

Where housing and homestead land problem is acute in some cases the landless wage earners shift to road side government lands, canal sides, village commons etc. The migratory wage earners in irrigated and intensive cropped areas are seen temporarily/permanently settled in this manner. This type of encroachments are supported by the local villagers due to the labour problem (later they get political support).

Where possible, people are also migrating from resource poor areas to resource rich areas, from degraded forest areas to forested areas. In the recent years, large scale illegal settlement in ecologically fragile areas has increased, which has grave implication on the environment and living of the people. Few such cases came across by the CPSW Village Environment Appraisal team provide interesting insights to this trend.

Settlement of Wage Earner Prreferred : Owing to spread of education, and the increase of unemployed youths, the diversification of wage earning activities of the traditional 'labourers' in many irrigated pockets, there is a shortage of agricultural wage earners. Hence, when wage earner families intend to settle in these areas on village commons etc. they get support from the villagers.

In the Past-Thauri area of Marshaghai Block of Kendrapara district about 15 families have made their houses in 3 locations on village commons and government land since 8-10 years with support from the villagers. This area now faces acute labour problem for agricultural activities as education has rendered the young unemployed and due to massive migration of traditional labour force to Surat weaving mills.

Migration from Resource Poor Areas to Resource Rich Areas : In Badasilinga forest area of Nayagarh district, the team came across a freshly established village, Talabari which has been established by clearing Sal forest by households from neighbouring villages, who had little agricultural land and homestead land in their original habitation. In almost all the villages of this area it is common to find outside homestead land and agricultural land seekers who have come here from degraded and populated forest areas of near by Phulbani district with support of near distant relatives. As a result encroachment and forest clearance is rampant in this area.

House on Gochar Land : Landless and socio-economically poor families shifting to road sides, canal sides, village commons have become very common and in some cases end up with inter village clashes.

In village Betanda of Rasulpur Block of Jajpur district Chakradhar Behera has made his house on village 'Gochara land' 30 years ago. His father had sold their agricultural land and homestead land due to poverty and after that they shifted to village 'Gochar'. Chakradhar told that no one can drive him out from village Gochara land, if they did it again he would stay at another place on village common land. Two years back people of 'Tanti sahi' had set fire to his house in a bid to make a 'Sahi Kothaghara'. A case was filed in the court and some people were arrested.

Settlement of Consttrruction Workers : In Tangi-Choudwar area of Cuttack district a number of new tribal habitations have come up. Tribal labourers from Keonjhar and Mayurbhanj areas who were engaged in the construction of Paradeep National Highway first settled in this area and then for the reason of easy availability of homestead and agricultural land many families joined with them later.

Owing to increased communication and transport facilities many small market complexes, eatery houses have come up at road sides, bus-stops, village junctions, etc. They too contribute to the pressure on house building material, space and in some cases are a nuisance to traffic as well as to nearby habitations.

CONFUSED TREND

Rapid depletion of bio-resource from village surroundings and the constantly increasing prices of the housing materials have given rise to various patterns and trends of adaptation to the situation specific to different regions in house making.

In villages close to degraded and semidegraded forest areas remodeling of old houses and new construction have considerably increased these days. Reason People sense that the forest and matured trees will soon be prey smugglers - so, why not make strong houses for the future generation before it is all finished. They make lavish use of wood - walls, ceiling, every thing is made of thick planks of matured wood.

The socio-economically poor families of close to forest villages who used to make 'temporary' houses using tender wood which necessitated change every 4/5 years as they get easily infested by pests now in changed times (in the past they did not dare to do this for fear of the village headmen) prefer to change the house infrastructure before their forests are finished. At present poor or rich, every one wants to make 'pucca' house if they can. Since very few have the ability to make pucca houses - with cement mortar plastered brick or stone wall and R.C.C./asbestos roof. Others have adapted to various ways to make their house appear 'pucca'. Mud walls are reinforced with stone/brick pillars, mud floors are made concrete, verandahs and bottom of the walls are made 'pucca' with cement and sand mortar.

In forested and degraded forested areas hectic activities of brick making are found - making the optimum use of the firewood, which people know will be finished in the near future. In Gania, Durapulla area the CPSW Village Environment Appraisal team came across many outsider agents involved in brick making in connivance with locally influential persons.

The scarcity of traditional house building material has affected the poor very seriously. While modern house building materials are very costly, it is difficult to find substitutes for locally available materials-leaves, grass, reeds, poles etc. which were once available in forests or in village commons.

When materials were available these households did not have a proper door made of wood - instead they had bamboo-made doors or shutters made of grass, reeds, etc. Now, even to have a bamboo made door is a costly affair in many places. Owing to this prohibitive cost of building materials many houses belonged to socio-economically poor do not have doors in inner rooms - instead they use tati, gainchi - shutters made of leaves, grass, reeds. In some cases, to reinforce the bamboo made doors people use recycled tins, pitch drums etc.

To minimise the cost, even in new houses people do not keep enough windows. It is unfortunate that when people are made aware of sanitation and hygiene they are not able to have proper ventilation due to prohibitive cost of wood. The decorated, carved heavy door frames and doors have become a thing of the past even for the rural rich.

This trend needs to be given proper direction otherwise this will end up in further degradation of environment, reduction of prime agricultural land and emergence of rural slums.

MORE CASES FROM CPSW VILLAGE ENVIRONMENT APPRAISAL : HOUSE OF DAYANIDHI DOMO

(Village Kalnsi, close to degraded forest, Keonjhar district)

Dayanidhi, Dhusasana and Duryodhana are three brothers. The elder brother Duryodhan lives in a 'palaghar' and the two younger brothers in a separate palaghar. The palaghar of Dayanidhi and Dhusasana is about 15 ft. long and 6 ft. wide and divided by a mud wall into separate rooms for each one. The size of each room is about 45 square feet. A hearth is found at the corner of the room. Fowls are kept inside the room during the night. Since they are basket makers, the finished and unfinished baskets are also kept inside. Few aluminum utensils are kept in one of the corners. Some pieces of cloth hang from alguni, a piece of bamboo suspended from the roof, to keep clothes on.

The only valuable and permanent material used in the roofing infrastructure is the 15ft. long fat bamboo which has been in use since their father's time. Except this bamboo seni, the materials used in the roofing infrastructure are tender branches, twigs, left over bamboo ends from basket making which get weak due to pest infection and require to be changed every 2/3 years. It is very difficult for them to collect twigs and branches for roofing infrastructure as the village forest is protected by the villagers and only dry leaves are collected. Thatching materials at present is collected from paddy left outs in the agricultural field. They had their house at the threshold of the forest 20/25 years back, but did not care to make a stronger house.

'Sukhabasi' of Mankadachuan is close to a degraded forest in Bolangir district. Driven by poverty and recurring drought situation many socio-economically poor families of western Orissa sell out their assets and become migratory wage earners, Sukhabasis, free of all bondages.

This Sukhabasi family had come to this village 14 years back. Here they eke out their living through agricultural wage earning, earth work, fuelwood selling. They have made their house on government land. They have three times applied to Tahasildar for ceiling and Bhogra land. As they told, the influential Gountia and rich Kondh farmers forcibly cultivate the ceiling and Bhogra land of that village. They were not sure of what would happen and where would they go.

WHAT IS THE SOLUTION ?

The following picture emerges from a brief summary of the situation. Owing to the general scarcity of the traditional house building materials, access to traditional sources of obtaining house building materials is getting difficult. The prices of both traditional and modern house building materials are too forbidding for the average people. Even those possess homestead land and ancestral house, find it difficult to carry out extensions, much less new constructions. The CPSW village environment appraisal in some villages reveals that over the last two decades less than 15 per cent of the households have been able to either expand or construct new houses despite more than 40 per cent increase in population during that period - people somehow adjust in one room/two room accommodations. For wage earners and people who operate outside the cash economy, even having a basic house with adequate space for all the family members is fast becoming a mirage.

It is clear that it is not possible to provide modern house building material to all in the foreseeable future. We have to face the reality. Indigenous ways of house building are very scientific, functional, compatible to the climatic situation and the material used is still available. Supply line of traditional housebuilding materials has not yet completely snapped though substantially decreased in many parts. This can be restored and made available sustainably. There is expertise available, in varied degrees, in the nook and corner of the state. The proven ones can be widely disseminated with clarity of intention and concerted effort many of the traditional materials can be made durable, maintainable. In many instances research and vigorous work has shown promising results especially giving stability to the most commonly used traditional housebuilding material, mud.

STAYBACK WITH MUD

It is since ten thousand years approximately that men have been constructing cities. Unbaked earth has been and continues to be one of the main materials of construction. More than a third of the inhabitants of our planet today live in earth habitations. 'Rural cultures, more than any others, have perpetuated a multiplicity of traditions in earth architecture. These are so diverse that it would be no easy task to draw up their inventory' - Observes Jean Dethier, Councillor Architect, George Pompidou Centre, Paris.

Though people still use mud as the main building material, they are somehow lured by the glamour of cement/concrete houses. In the CPSW village environment appraisal almost all the respondents opted for a 'Kothaghar', brick house. It is estimated that, because of uncontrolled growth of population, the shortage of housing in India would roughly be 29 millions by 1991 and 39 millions by 2000 A.D. Approximately, 80 per cent of the total housing shortage is for economically weaker sections. Since these households can not afford a Kothaghar which is quite costly now a days and building materials like cement, steel, etc., are much costlier and in short supply, there is an urgent need to develop an alternative housing with locally available materials to suit to their needs and financial capability.

In our country, over sixty-five million houses out of about one hundred eighteen million houses are made of mud. This assumes great importance considering India's large population of houseless and ill housed people, and cheapness and the widespread availability of mud. Considering the scarcity and high cost of conventional building materials such as brick, cement and steel one way to solve the country's severe housing shortage of unestimated 40 million units by 2000, is to switch over to the use of mud.

"Even the simplest calculations will show that steel, cement and bricks can not provide shelter to all in a country like India at least not in the foreseeable future. Both the energy and financial costs of such forms of shelter are extremely high and the fact is that the majority of the households in the third world can not afford to purchase even the cheapest modern house, whose cost, in any case, is bound to increase as fuel prices rise" - (editorial in Down to Earth). Mud has other inherent advantages - it is extremely malleable and offers better insulation than steel-and concrete structures, it decentralises the construction process because it utilises local material and technology and thereby obviates the need for contractor, and it costs much less to maintain mud buildings.

Earth is a natural material available in abundance in most parts of India. Its use guarantees the maintenance of ecological balances and a respect for the environment. The diversity of ways of using mud enables a choice between recourse either to a very large and unskilled work force or to very sophisticated practices. Mud also is an ideal choice for ensuring self construction and immense employment opportunities.

"In addition to its advantages in political and economic, social, technical and ecological terms, earth as a material has cultural and architectural importance. The diversity of earth architecture and of the possible modes of construction is a surety against cultural imperialism and the return to uniformity and to universal norms of the 'International style' which we are barely managing to do away with during the last few years." - observes Jean Dethier, Counciller Architect, Georges Pompidou Centre, Paris.

Recourse to earth architecture could facilitate the vital reintegration of architecture into the various cultural and folk traditions specific to different communities and help reconcile the meaning and the use of the spirit of the place, while recreating a dynamic coherence and a continuous link between past, present, and future.

Use of mud also provides great economy in construction in terms of energy. This is an important advantage because of the very fact that the energy utilised in the building sector of public works consumes a substantial percentage of the national consumption. While, the manufacture of unbaked earth bricks utilises a negligible amount of energy or even none at all, since these are not fired (a process which requires the heating of furnaces to a temperature of 900 to 1,000 degrees centigrade) and as they are produced on the site locally, they involve very little expense on transport, if at all. A house with 100 sq.m. area consumes 7.5 tonnes of fuel wood just to fire the bricks.

Explaining mud buildings cost effectiveness Shrashtant Patara, an architect at the Development Alternatives, a Delhi based organisation working on alternate technologies for sustainable growth observes that while conventional brick construction can cost as much as Rs.1,614/sq.m. (Rs.150 sq.ft), a mud house with modern inputs costs as little as Rs.215/sq.m. (Rs.20 sq.m.).

In addition to the economy on energy the use of earth buildings enables economies on heating and cooling. The very nature of earth walls, if properly exploited, can lead both to a reduction of heat loss and a feeling of genuine 'thermal comfort'. Mud-building can become a more attractive technology only if appropriate roofing material is developed, but very little has been done in this regard.

Contrary to what most people think, mud structures do not deteriorate rapidly provided they are properly maintained. Part of mud's poor reputation is because long-established mud-building techniques have been forgotten or ignored. Though people have been building mud houses for thousands of years, the technology is still not sufficiently developed or widely known.

The development of stabilisation techniques such as adding cement to mud has done away with many drawbacks associated with mud-building. Stabilised mud blocks are also less susceptible to termites and rodents.

Strong as steel : Mud is no longer inferior as a building material, it can be strengthened and stabilised to function as a viable alternative to concrete and steel. Traditional mud-building methods include mixing specified quantities of rice husk, cow dung or lime with row earth. One of the oldest techniques is the wattle and daub method, in which mud is meshed with sticks for strengthening. Making adobe blocks or sun-dried bricks, is another simple process used extensively in the rural areas of Kerala and Tamilnadu.

Major drawbacks of mud as a building material are its low tensile strength it breaks if stretched or place under stress and high water absorption. Mud blocks made of certain soils increase in volume on absorbing water, and shrink when dry, leading to cracks in mud structures. Revathi and Vasanth Kamath, who were formerly on the faculty of the Delhi School of Planning and Architecture, have developed a technique of using mud without additives. They suggest that to make unstabilised blocks, mud and water could be mixed and kneaded about five times in as many days to give it plasticity, and then the blocks would be baked in the sun.

As sandy soils are less amenable to compaction, they can be mixed with clay to achieve the desired compaction level. And, as black soil contains more organic matter and therefore absorbs water easily, it can be treated by mixing with sandy soil. All these methods are used widely in adobe technology. Stabilised mud blocks are made by mixing mud with additives like cement, line Jaggery syrup or starch solution. They are then compressed and dried in the sun. Compression not only gives mud blocks uniform strength, it also increases their cohesive and tensile strength and makes them better building material. Bitumen can also be mixed with mud to increase its water resistance and increased compaction reduces a mud block's water absorptive capacity.

Stabilised mud blocks are not only as strong as burnt bricks, they are more water resistant and can be produced locally. Dry strength for stabilised mud blocks is 30 to 35 kg. per sq.cm. compared with burnt bricks strength of 20 to 30 kg per sq.km. Stabilised mud blocks are strong enough to construct a two stored building.

A significant breakthrough in mud technology was achieved at the Victorian University of Technology (VUT) in Melbourne, when researchers developed a liquid that gives mud bricks water penetration resistance almost similar to that of clay bricks. The water based repellent has been used successfully in a mud housing project in Port Moresby, the capital of Papua New Guinea, and this offers an enormous cost saving potential for developing countries such as India.

SOURCE : **Down To Earth, October 15th 1992.**

MUD HOUSES : FALLS SHORT OF PEOPLES IMAGINATION

Most Indians consider a house an appreciating assest and a long lasting investment and so even the poor dream of a brick-and-mortar home. People seize any small opportunity to convert any portion of their houses into brick mortar ones. Only Pucca front verandahs, mud walls with pucca finish, pucca Vrindabati, pucca court-yard etc. are common sight in most of the villages in our state. If people are to accept the use of mud in house construction, they must be shown it can be made to last longer and at costs they can afford to.

But this has not yet happened. It has been a significant problem plaguing housing institutions, architects and building designers to make mud an acceptable building material. Over the years few institutions have came up who have been seriously trying to promote mud & developing methods to enhance its acceptability.

For the last three decades, British-born architect Laurie Baker has been promoting low-cost building technology in India. The Laurie Baker Mud Foundation was established at Trichur in Kerala in 1989, primarily to, popularise and conduct studies in mud architecture.

The other agencies promoting mud include HUDCO, the apex body of the country's building sector, is under the Ministry of Urban Development. HUDCO has set up a nation-wide network of about 105 Nirmit Kendras (building centres) to disseminate appropriate building technology, including mud architecture. The first of the centres, which received Rs.1.55 crore as grants during 1991-92, was started in 1985 at Kollam, Kerala.

Besides promoting mud-building technology for housing, the centres manufacture stabilised mud blocks with 5 per cent cement content. The blocks, made with ASTRA designed presses, can withstand pressures of upto 45 kg. per sq.cm. the minimum is 20 kg. per sq.cm. The blocks cost 90 paise each about half the cost of a burnt brick of similar size.

Mud house, but strong as steel. If more research can be done on these kind of house building materials, it will be of great utility to rural Housing.



Pix : Sanjay K. Khatua.

The Kollam Nirmit Kendra also trains artisans and rural youth in building techniques. Mud as a building material can be strengthened and stabilise by using different methods. In this context use of stablilised mud blocks is gradually gaining acceptability.

The efficiency of mud blocks depends crucially on mixing the right proportions : 4 to 5 per cent cement, 25 to 30 per cent sand and a fixed proportion of lime. Because if the exact quantity of cement and sand is determined according to the soil composition, proper soil testing is essential before mud blocks are made.

ASTRA'S STABILISED MUD BLOCK MOVEMENT

The first group to work seriously on stabilised mud blocks was based at Bangalore. Over the years, the group has achieved significant breakthrough in mud technology.

In 1976, the bio-gas lab of the Centre for Application of Science and Technology to Rural Areas (ASTRA) was constructed on the Indian Institute of Science campus in Bangalore with unique buildings blocks. They were not conventional klin-fired bricks but stabilised mud blocks. Fourteen years and three machine-designs later, about 100 buildings had been completed, using mud blocks stabilised with a small quantity of cement.

Amulya Reddy, an ASTRA founding father seeking to develop a technology for rural areas, bought a Cinvaram, an early block waking machine developed by a Latin American Engineer in 1956. It was modified and renamed ASTRAM, but the model soon become obsolete. The present model is called Itge Voth (brick press, in Kannada).

The Itge Voth's operations are easy and can be mastered by semi-skilled and unskilled workers in only a few hours. As it weighs just 160 kg. It can be transported easily to construction sites. Blocks are moulded using a mixture of soil, cement and a small amount of water. The concentration of cement in the mixture can vary between 3.5 per cent and 7 per cent, depending on the quality of the soil. Just enough water is added to hold the mixture together. Two standard moulds are used in this process. one measuring 30.5 x 14.3 x 10 cm and the other 23 x 19 x 10cm. But moulds can be made to size, as for example, the moulds used by Madras Fertilisers Ltd. (MFL) in the construction of 90 houses in Manali. After moulding the blocks are stacked and cured by sprinkling water on them for a week. They are than ready for use. In MFL projects, which ASTRA's, K.S.Jagdish rates as the best example of a systematic large-scale operation using mud blocks, tests showed that seven days of curing is sufficient for the blocks to become strong enough for use in a two storeyed building. At Manali, MFL is using a 7 per cent cement mix and the strength of the blocks is around 25 kg. per sq.cm. which is enough to construct a three-story building.

Because the blocks are not kiln-fired there is an immediate saving of fuel energy up to 70 per cent. The total cost of a mud block is between Rs.1.65 and Rs.1.95, depending on the construction site. As the mud block is 2.5 times the size of a conventional brick, it's cost equivalent works out to 65 to 75 paise. The cost of a burnt brick is rarely less than one rupee. The machine on an average can produce one lakh blocks before it needs refitting and during this period, seven labourers can get work.

SOURCE : Down to Earth, Oct, 15,1992. Based on. The building blocks of a movement ' S.Gopikrishna Warrier, Bangalore.

MUD : PROBLEM OF ACCEPTANCE

"The base of a thousand-year-old Pyramid, built in unbaked clay near Cairo by King Asydis, Carries the following inscription - Do not despise me with Pyramids of stone : I am as far above them as Jupiter is above the other gods, as I have been built with bricks made of loan drawn from the depths of the lake ! Even so, Prejudices against construction in unbaked earth have survived".

The Prejudice against earth often stems from the absence of sufficiently qualified people who take on the designing as well as the total execution of earth construction projects.

"Recently, some mud houses built on the outskirts of Bangalore have developed cracks, raising doubts about the liability of mud as a building material. A large number of the over 700 mud houses build by the Karnataka Housing Board (KHB) at Yelahanka near Bangalore are showing signs of falling apart. This is a major set back to a Project that V.Suresh, a HUDCO director who was then KHB chairman, once described as a 'glowing demonstration of the durability of stabilized mud blocks."

K.S.Jagdish, who heads Centre for the Application of Science and Technology to Rural Areas (ASTRA) unequivocally blames the KHB and HUDCO for launching the Project without carrying out proper tests or considering its viability for Bangalore city. "The idea of using these blocks is to save energy and we have never propagated this technology as a cost saving device", said Mr.Jagdish, "In fact, in Bangalore we may even have to get suitable mud from outside the city and it may work out to be as expensive as brick buildings". Furthermore, Jagdish contended, the KHB hired contractors who did not care about the technology and saved on cement, sand and lime.

However, stabilized mud blocks have also been found appropriate for rural Karnataka and Voluntary agencies such as MYRADA and Gramashrama are using them to build houses in the Coondapur taluka in South Kanara district, an area prone to heavy rain.

In a bid to promote the use of stabilized mud blocks, HUDCO offers a 50 per cent subsidy on block - making machines for professional and educational institutions and 25 per cent to housing agencies and building centres. But it is questioned whether mud building technology can be disseminated effectively by a centralized agency such as HUDCO. If the technology is to work, the people must be involved in it.

The state governments of Nagaland and Jammu and Kashmir have also promoted the use of stabilized mud blocks in a big way. Nagaland's rural development department has undertaken a major programme in training people in mud building technology, primarily because burnt brick is expensive and the local soil is ideal for mud blocks. In Andhra Pradesh and Gujurat too, the state housing boards and HUDCO have been putting up mud buildings.

Sales of mud block presses to non-governmental organizations is reportedly increasing steadily in Orissa. Despite the exemplary increases, it has not been able to effect any significant change in the attitude of planners, architects towards use of mud as building material. Even though the government, attaches much importance to the use of local materials it is yet to come out boldly to make use of the improved techniques concerning the use of the traditional house building materials in its housing schemes, barring the social housing schemes for the poor and the weaker, which in most of the cases turn out to be a mockery of using low cost traditional house building materials.

DEVELOPMENT ALTERNATIVES : TRYST WITH MUD

Development Alternatives (Delhi based NGO) shelter group has also been working on a number of appropriate building systems using compressed earth blocks. In 1988, DA even opted to build its headquarters with this material with a Rs.5 lakh grant from HUDCO. This was one of the first mud structures to be approved by as per the building codes.

Since 1985, DA has also designed and built houses for a number public institutions using mud technology. In 1987 a team of architects and engineers headed by Ashok Khosal, founder of DA, began construction of a 930 sq.m. building (10,000 sq.ft.) and completed it in 1989. "The main objective of the group was to demonstrate that raw earth was a viable construction material". "It was also meant to prove that earth buildings could be designed to comply with the construction codes of urban development.

At the outset, a suitable soil block press was designed and named the BALRAM Press. The building was designed as a composite structure that would use a range of mud-building techniques, including mud blocks made by BALRAM Press with clay brought in specially from Mehrauli, in South Delhi.

As this was the first mud building to be submitted to Delhi Development Authority for clearance, DA designers took great care to calculate and establish the carrying capacity of unstabilized mud blocks. Neeraj Manchand, an architect involved with the project concedes that several mistakes were made and many hard lessons learnt. As the walls were built initially with compressed mud blocks without cement stabilization and lime based plaster, the plastering began to peel off in the rain and had to be replaced with cement. A dome measuring 7 m. in diameter making it the largest mud built dome in Asia - was built initially with unstabilized mud blocks. It collapsed during construction and had to be rebuilt using stabilized mud blocks and now it can reportedly withstand any load or weather condition.

SOURCE : **Based on Koshy Cherail's article mud housing in the key, Down to Earth, Oct. 15, 1992.**

ALTERNATIVES GALORE : NOT READY FOR MASS IMPLEMENTATION

Extensive research and experimentation has also been oriented &directed towards exploring & developing other ways of low cost housing technology, techniques of prefabrication and the technology devoted to development of new materials of construction.

SERC, Madras has developed several systems of roofing, flooring and walling for prefabricated houses incorporating locally available materials, such as clay blocks and use of aerated cellular concrete products. Experiment reveals that a single storied construction with circular layout would reduce the cost to a large extent. Circular shape helps in resisting large wind forces, hence considered suitable for houses built in cyclone-prone areas.

Experiment is also being carried out on the strength of ferro cement roofing elements for low cost housing. Ferro cement roofing, when adopted for low cost housing, is cheaper than corrugated galvanized iron sheet or asbestos cement roofing by 30 per cent and cheaper than reinforced cement concrete roof by 50 per cent. Research is on to develop house building material from a variety of agriculture and forest wastes which are locally available such as rice husk, straw jute stalk, bagasses, vegetable fibres, leaves, coir, reeds, wood wastes, twigs, etc. And so far, the production and use of the cement fibre roofing sheets, rice-husk and lime binder, straw building boards, gypsum -fibre boards, wire-bound reed boards, boards from wood wastes, bamboo-reinforced concrete asphaltic roofing sheets from celluloric waste, etc. have been developed.

Research is also on to circumvent the main shortcomings in the use of traditional materials like grass, straw, reeds, bamboo woods etc. in which decaying factor is much quicker, which need frequent replacement and are prone to pest infection, fire hazards etc. Research include fire treatment for thatched roof, preservative treatment for thatch and bamboos, seasoning and treatment of wood, etc. Similarly, research and development has also been carried out to produce water proof mud plaster for mud walls, improved clay roofing etc.

But unfortunately, none of the above discussed research and development has yet percolated to the grassroot level. There is no concerted effort in sight to carry the successful experiments to the people. Most of these experiments are expensive and have adequately not been taken out of the laboratory for mass production.

HOUSING IN FIVE YEAR PLANS AND SUPPORT ORGANIZATIONS

Until the Fifth Five Year Plan, the planning commission considered the housing programme for government employees, industrial workers, staff in Community Development Blocks and persons in middle and low income groups by providing assistance. But it did not pay due attention to the weaker sections of rural areas, such as scheduled castes, scheduled tribes and the other landless for whom housing is a basic need. The Third Plan regarded rural housing as the basic need. It regarded rural housing as a part of community development but the Planning Commission has shown its dissatisfaction over the slow progress of the village housing scheme on account of general unwillingness of the villagers in most of the states. In the Fourth Five Year Plan, the Planning Commission made a provision of Rs.50 crores for the provision of house sites for scheduled castes, landless agricultural workers and small peasants in the villages.

The Fourth Plan advocated provision of cheaper houses through organizing supply of materials and by pursuing research into the practicable schemes of cheaper wages of building. The Fourth Plan undertook the Minimum Needs Programme (MNP) which included provision of free house sites to poor rural landless families estimated to be over 14.6 million, potable water supply and improved sanitation. In successive plans, provision of assistance for construction was also included in the programme.

20-POINT PROGRAMME

The 20-point economic programme of 1975 gave further impetus to the time-bound-implementation of the rural house site scheme and construction assistance programme. The revised Twenty Point Programme in 1986 included programmes of allotment of house-sites construction assistance to the rural landless workers, the environmental improvement of urban slums and houses for economically weaker sections constitute the housing component in the TPP. Under the scheme of housing for the people, the aim is to make available house-sites to the rural poor, expand programmes of house construction, lay special emphasis on construction of houses of SC/STs and develop low cost building materials. With the problem of housing slowly but steadily assuming larger dimensions, the Fifth Plan stressed that, "a proper strategy for the housing sector can not, therefore, be thought of in isolation and unrelated to a well formulated land policy".

INDIRA AWAS YOJANA

The other major housing scheme for the poor and the weaker sections include Indira Awas Yojana (IAY) which was started as a programme in 1985-86 as part of the Rural Landless Employment Guarantee Programme (RLEGP). IAY aims at construction of dwelling units free of cost for the poorest of the poor belonging to scheduled castes, scheduled tribes and freed bonded labourers and is now being implemented under Jawahar Rozagar Yojana (JRY). Houses under IAY, as far as possible, are built in clusters as per microhabitat approach so that common facilities can be provided for the clusters, including environmental improvements involving low cost laying of streets, drains, provision of sanitary latrines and drinking water facilities etc. The emphasis is on construction of houses having floor area of 17 to 20 square metres costing less than Rs.6000/- for Kutcha houses and Rs.10,000/- for Pucca houses in rural areas.

NATIONAL BUILDING ORGANIZATION (NBO)

The NBO was set up in 1954 as an advisory and coordinating body for all technical matters concerning building and housing. It has been engaged with the collection, coordination and dissemination of information with regard to new and innovative methods of construction for effecting cost economy, designing of low cost houses, optimise the use of local raw materials, etc.

HOUSING AND URBAN DEVELOPMENT CORPORATION (HUDCO)

The HUDCO set up in 1970 included in its charter financing of housing and urban development programmes, setting up of new or satellite towns and the setting up of building material industries. It would also promote, establish, assist, collaborate and provide consultancy services for the projects of designing and planning of works relating to housing (including rural housing) and urban development programmes.

NAKHAUR HARIJAN SAHI, 10 KMS, FROM BHUBANESWAR

At present about 28 harijan households of this village are living under 16 houses, most of which are made by HUDCO after the 1982 flood. Unlike the other households, harijan sahi people do not have spacious backyards. Hence construction of new houses or extension poses a great problem for these people as family division is very common.

Sons get separated after they get married and are capable of earning. Rooms and homestead land are divided only on verbal understanding and they continue to live in the same house. The living space is so scarce that in one case two couples shared one room during night by using clothes as separators. But inspite of acute housing shortage no one has been able to make new construction. They somehow manage with the housing shortage. Most of the unmarried youths sleep at the Kothaghar of the sahi.

THE NATIONAL HOUSING BANK (NHB)

The National Housing Bank (NHB) Bill was passed by Parliament during November - December, 1987. And the NHB was set-up on July 9, 1988 with its head office in Delhi. It is a statutory corporation with its entire initial share capital of Rs.1000 million subscribed by the Reserve Bank of India.

The primary responsibility of the Housing Bank is to promote and develop specialized housing finance institutions in the country. These institutions would mobilize resources and extend credit for housing. The NHB will provide refinance to housing finance institutions and scheduled banks. Besides providing guarantee and underwriting facilities to housing finance institutions, it would formulate schemes, particularly for the economically weaker sections of the society. It would give guidelines to the participating institutions to ensure their growth on sound lines and coordinate the working of all agencies that are involved in the housing finance.

RURAL HOUSING PROGRAMME OF ORISSA

In Orissa "Three departments are involved in rural housing although Housing & Urban Development (H & U.D) has a major role to play. The revenue department is responsible for allotment of house sites. The Panchayat Raj department is implementing Indira Awas Yojana for the poorest of the poor in different villages. The H & U.D. Department is incharge of implementing four schemes, namely Integrated Housing Scheme, Village Housing Scheme, Bidi Workers Housing Scheme and Demonstration Housing Scheme. The Orissa State Housing Board is the nodal agency of the Department for implementation of such schemes. Sometimes the Orissa Co-operative Housing Corporation is also aggravated in the village housing schemes. There is a rural housing cell under H & U.D. Department which also in collaboration with O.S.H.B. co-ordinates the implementation of the programme". (8th Plan, 600, Vol.I)

NATIONAL HOUSING POLICY : FAR FROM REALITIES

Unfortunately, the ground realities are seldom reflected in the housing programmes and policies formulated by the government. The nation got a national housing policy for the first time after independence only in 1991. Housing was on the concurrent list and the states were engaged in different housing projects earlier too. The National Policy was passed by parliament full three years after it was presented to it.

It lays emphasis on rural housing including :

-Provision of house sites to scheduled castes and schedule tribes, freed bonded labourers and landless labourers, including artisans and provision of financial assistance for house construction to them on suitable loan cum subsidy basis.

-Accessibility to institutional finance,

-Strengthening the supply and delivery system for building materials and components,

-Skills development and upgradation programmes,

-Development of appropriate technology and its propagations,

-Special programmes for victims of natural calamities.

The special needs of women and their active participation in housing improvement programmes have also been incorporated in the National Housing Policy. Among other things, the policy intends to up-grade all Kutcha houses in urban areas also along with improving the housing conditions of slum dwellers, squatters and other economically weaker sections. But, then whether the new housing policy will be able to set at naught the serious problems of high land costs in urban areas, degrading slum conditions and more than anything else, the drift towards urbanisation that is likely collapse big cities, remains a million dollar question.

"The most fundamental point that needs to be recognized aside from the fact that housing is one of the most basic needs of woman, man and child, and that it is a basic human right is that housing is not simply a question of four walls and a roof. Nor is it even - in fact, less so - a question of having enough wages or credit, as

is so commonly shown as being the problem. Housing, today, has passed even this stage, money can no longer buy housing - if, indeed, it could even buy right to live in security and dignity" - observes Jai Sen, Architect and Convener, National Campaign for Housing rights, Calcutta (Seminar, August 1990).

He further observes, "There are at least five contradictions in India today which prevent people from being able to live in security and dignity, which violate the basic human right to housing, and which are at least as fundamental as the question of wages, and against which wages and credit (the latter being the focus of the policy) can hardly have any effect. They are that which over burden you like communalism, environmental hazards, the destruction of the environment, the commercialization of all housing resources and the simultaneous removal of age-old, traditional rights of access, and patriarchy".

He further notes "What is worse is that the policy will only serve to deepen the contradictions and worsen housing conditions in the country for the vast majority. It was prepared officially by technocrats (in a ministry concerned solely with urban development) who know little about the vast majority of the country which is rural, and care less. Their concern, in collusion with builders, industry and the finance world, was solely with promoting housing as an industrial commodity which can be bought and sold and which can be used as a way of expanding the market".

No general consensus seems to exist on the meaning of the term "housing". In its widest connotation, housing is more than shelter. It embodies the whole network of services and amenities available to make living reasonable and comfortable. According to the World Health Organization, it is "the residential environment, neighbourhood, micro-district or the physical structure that man-kind uses for shelter and the environs of that structure, including all necessary services, facilities, equipment and devices needed for the physical health and wellbeing of the family and the individual." The social customs, traditions and occupation of the people have played a decisive role in the historical evolution of the house types in villages. These aspects have to be taken into account in the choice of technology in order that the houses are acceptable to the people for fulfilling their social and functional needs.

What is not adequately taken into consideration in this policy is the fact that house is not just four walls with a roof above, but a home, a community, mainting social, cultural and economic life, where people should stay not just to survive but to prosper. More important is the question of getting house building material in village areas where more than 80 per cent of the people live and most of whom live not in the cash economy but in bio-mass economy. And equally important is to get the other matters of basic survival - fuel, fodder, water etc. in the surrounding. The policy does not much reflect on these issues.

Another problem for the poor, who as per the government terms live in temporary Kutcha houses are the threat of environmental hazards - flood, cyclone, mining which are often man made. In the cyclone prone coastal areas people live under constant threat of cyclone with their fragile houses, which is increasingly becoming difficult to maintain due to severe depletion of bio-resources. In many flood planes of Orissa the protection embankments, due to siltation of river beds have risen above the roof level putting many a villages under death trap. In Talcher area houses reportedly develop crack and collapse due to faulty and careless coal mining operations. Many areas are also threatened by mining and pollution caused by industries established by flouting environmental laws.

In many previously forested tribal, Garhjat areas the age old housing sites become useless with the disappearance of day to day survival items from the village surrounding, cultivation and other activities becoming difficult to pursue, necessitating shifting to other places. There is a substantial nomadic population in the state which recurringly require bio-resource based housing material for their settlements. These factors have not been reflected in the National Housing Policy.

Destruction of environment as a resource base for house building materials for millions of houses has also not been taken seriously. The destruction of the environment that is taking place is leading to a situation where the basic resources needed by the people to house themselves are no longer available.

This is especially critical since a substantial percentage of our population depend directly on nature (the bio-mass) for its material of housing requirements such as bamboo, wood, stone, thatch, as well as for water, fire-wood and fodder for animals. But today, the destruction of the environment for commercial gain is leading to a situation where this vast mass of people - the great majority of which has no buying power - is losing the resources that were once available, and their housing and living conditions are rapidly worsening as the destruction mounts. This is also a housing question that the policy must answer. Closely linked to the destruction of housing resource is the deliberate, planned commercialization of housing resources of land, water, building materials, fuel and fodder - so that the market can expand and exploitation can take place. This is being achieved through new laws, government orders and policies in all fields'. - observes Jai Sen.

Indira Awas Jojana Housing Scheme near Sinapalli village in Bongamunda-Khariar Road. Do the homeless benefit from this ? People's needs, their culture and involvement is essential.



Pix Sanjay K. Khatua

But in a situation of deep and widespread poverty - where a considerable portion of the population live in shanty houses - even as they are not able to carry out the customary annual maintenance to their ancestral houses, save the chance of extension - as they do not have cash to buy things as the bio-mass once freely available are getting scarce day by day. While any viable alternative system to replace the traditional practice is yet to emerge, people are systematically uprooted from the traditional life support systematically uprooted from the traditional life support system and forced to face the exploitative market force. This situation is going to get worsened as at present destitution, migration in some pockets have risen to an alarming proposition.

Encroachment and plundering of forest resources, plantations for house building is only the result of desperation created by age old negligence and short sightedness of the planners.

Patriarchy, the system of internal colonization and subjugation, where housing - expressed through property, title, recognition as head of household - is a major means of keeping the other half of society which comprises women, dispossessed, oppressed and homeless. There are some who argue that women are essentially homeless - with rights neither to their natal nor to their maternal homes. There is, in our society,no place for the single women, before or after marriage. The National Housing Policy must address both halves of the nation. - further observes Jai Sen.

The new housing policy must declare that providing shelter to the home-less is a basic human right which, indeed, should be enshrined in the constitution. The campaign for human rights involves the question of preventing eviction of poor people from their existing dwelling units along with the construction of new houses. There is an urgent need for stopping people living in the villages from making a bee-line to the cities. While the problem is mainly economic rather than social, the steps taken to diversify economic activity to smaller or ring towns have somehow not brought the desired results.

ORISSA GOVERNMENT'S EIGHTTH FIVE YEAR PLAN POLICY : NOT LEARNING FROM PAST EXPERIENCES

The 8th Five Year Plan document observes " There is an urgent need to seriously and radically re-examine the process of housing to disentangle it from the production of houses, and to redefine the roles of those who intervene in it. It is necessary to emphasise the fact that we are dealing with continuing and very changing process, not just with projects that have distinct starting and finishing points. Four key issues are, the planning and allocation of land, the support and involvement of people able and willing to organize their own housing and local development, the generation and support of local finance systems and continuous upgradation of the existing housing stock. It is therefore, in essence to adopt the implementation of a support policy for rural housing instead of the govt. planning the rule of supplier of housing units.

Recently the state govt. has floated another scheme - 'Kalinga Kutir Yojana' with the objective of providing support to the people who are suffering because of housing problem. This has provision to provide financial support to the needy through HUDCO and the programme will be implemented through the State Housing Board. Under this scheme each Grampanchayat will be taken as a unit. There will be a village committee at village level and community management committee at Panchayat level. The needy persons will be identified and provided support through consultation with these committees. This scheme also intend to propagate disaster proof houses, especially fire proof houses to start with. Besides, the state govt. has plan to provide low cost building material through utilization of modern technical know-how through the Building Centres located in each district.

However, it is observed that the social housing schemes, in most cases, are unsuitable for living due to the poor quality of structure and amenities. As a result in most cases the occupant beneficiaries mass abandon their housing clusters, which are usually located at roadsides, village graveyards, fallow lands, bald hills and in all sorts of god forbidden places. The remains of these abandoned structures stand as relics of the wrong perception of the housing needs of the poor and the weaker people. In many cases the beneficiaries refuse to occupy the housing schemes because of poor quality.

Though the govt. is attaching much importance to the designs suitable to the local climate and socio-cultural practices, use of local materials etc. social housing clusters in many a forested tribal areas, are provided with asbestos roofs where replacement would be an uphill task. During the Village Environment Appraisal Study the CPSW team found housing colonies made for tribals with asbestos roof in Brambanigaon and Daringbadi areas of Phulbani district. Being extreme in its climate too cold in winter and too hot in summer the Kondh tribals do no prefer to live in these low lying asbestos roofed houses which become like frying pan during summer. Instead, they live in extensions made with local materials-stone, grass and logs which are abundantly available in the surrounding forests or continue to live in their old houses.

Importance is also given to the development of the environment of the micro habitats. Usually, most of the social housing clusters are built in degraded lands, away from the habitation, without any vegetation around. The news papers are replete with the failure of these much publicized housing schemes, collapse of structures during rainy season, abandoned housing sites, lack of drinking water and basic utility facilities etc. from all corners of the state. The major reasons for the failure of the social housing schemes is the lack of motivation with the persons entrusted with the work, lack of involvement of the beneficiaries, lack of clarity of intention and almost fetish obsessions with the magic word 'Low-cost'. Low cost houses, low cost latrines, low cost sanitary provision etc. side lining the other important aspect, the aesthetic needs, socio-cultural life style, climate, locally available materials, sustainability and maintainability. And the most amazing thing is that the lessons are never learnt, change in attitude take years to gather even after experiencing repeated failures.

It is just not a question of creating low cost model rural houses. It is rather a question of creating those houses, even if with some extra costs, which would at least be maintainable in future and have minimum possible amenities, compatibility to socio-cultural-occupational needs and practices, minimum relevance to the locally available materials and expertise which will attract and arouse the houseless poor to a decent living morally, socially and materially. The new policies have again failed to adequately understand the housing problem in the rural areas and not learnt from the failure of the schemes implemented in the past.

TRADITIONAL HOUSE BUILDING MATERIAL : KEY TO THE RURAL HOUSING PROBLEM

If we consider the crude ground realities, the problem is related to rural housing boardly are : loack of homestead land, lack of housing accommodation sufficient for all the family members and other occupational needs, houses badly constructed/designed wasting space and material without ventilation and sanitation provisions and no space for extension, problem of recurring routine maintenance, problem of extension to accommodate increasing family members, vulnerability of traditional houses to natural disasters fire, cyclone, flood etc.

Except the homestead land problem, all the other problems are more or less related to the availability of traditional house building materials and the access to them, and most of these problems can find practical solutions if these materials are made sustainably available. This has been discussed elaborately in the previous chapters.

The scarcity of traditional house building materials caused due to wide spread environment degradation and destruction of sources from which the socio-economically poor were obtaining their house building materials free of cost, and the resultant price hike of the traditional house building material where available, making it out of reach for many are the major factors in housing which should be considered seriously and right kind of strategy be undertaken for generation and management of these materials instead of giving undue importance to top heavy support structures. This assumes further importance because of the fact that it does not seem possible to provide modern building materials to all in the foreseeable future and the wanton destruction of environment that goes along with it. Moreover, housing is not one time affair - it requires recurring maintenance, renovation, extension - hence, a sustainable resource base of traditional house building materials will go a long way in handling the problem. More importantly, the sustainable generation and use of the traditional house building materials can contribute substantially to restore and sustain the ecology of the region.

A substantial amount of ceiling Bhogara and Bhoodou land are still lying unutilized. Accelerated and proper distribution of those lands can provide houseites to many. Pressure on prime agricultural land in villages can be minimised through propagation of appropriate house designs - striking a perfect balance between economy of space and the socio-cultural and occupational needs. In many cases due to absence of good designs new houses are built involving wastage of lots of space while being low in utility value, without ventilation and sanitation provisions. Appropriate designs for various regions taking into consideration their socio-cultural-occupational needs, climate, availability of local materials, existing expertise, esthetic values, should be widely disseminated and the local artisans, masons, traditional house builders be made aware of these aspects.

The concept of village housing planning should be introduced and disseminated taking into consideration the future growth, social utility spaces, environment, sanitation etc. This can help in avoiding congestion, scattered housing and make it easier to provide physical services like road, water sources etc.

A substantial portion of the state is prone to natural disaster like cyclone and flood. And a considerable number of houses are gutted due to fire hazard every year. The proven appropriate and acceptable techniques (reinforcement to traditional materials) to fight these hazards should be disseminated in these areas and other permanent measures be undertaken to minimise the onslaught of these disasters (shelter plantation etc.) and generation of adequate biomass house building materials.

The technologies so far developed/tested to give stability and durability to traditional materials and the appropriate low cost house designs should be brought out of the controlled experiment level and taken to the masses. Famous architect Laurie Baker once observed "one way of demonstrating to the poor that low cost building does not mean poor quality is to do similar things for the rich." The government must show courage and clarity of intention in implementing these technology also in urban housing schemes. In many cases the experiments to develop low cost housing materials have ended up in expensive and clumsy solutions. These experts should take time to learn from the proven traditional technologies of using traditional materials and the socio-cultural occupational needs and aesthetic values. The proven traditional expertise which exist within the state should also be disseminated in different regions.

In rural areas as well as in urban areas, another important aspect which should be widely disseminated and understood by the planners that in order to create, one must not necessarily destroy. All efforts must be made to protect the environment and make people active partners in doing so. What to speak of other areas, in the state capital Bhubaneswar and its outgrowth, though sculpted out of a forested, vegetated area (the present housing construction sites also) there is hardly any natural area left without destruction.

Innumerable materials which are used in traditional houses has the scope to be made more durable, maintainable. Many indigenous expertise which lay scattered in remote corners needs to be recognized, upgraded and used and many indigenous housing designs which bears the long standing heritage and stand as epitome of proven wisdom, has the potential to be adopted in present building programmes.

To reiterate, the wisdom lies in utilizing and developing what the people have and can have in foreseeable future, which can provide them with socio-cultural moral satisfaction and identify of their own. And, when possible these be supplemented with modern support systems to make them durable, maintainable, more habitable.

Locally available material and expertise are the key to the housing problem and can go a long way in providing Baikuntha Saman Ghar - houses which can be compared with the abode of Vishnu - the height of psychological comfort and satisfaction that the average Oriyas perceive, "A plant in the backyard has no value", says an Indian proverb. This attitude, which has been the bane of Indian society - and that of nation of the south repeatedly tends to overlook the traditional pursuit of the modern". The time has come to look back.